

**WIN A COMPLETE SET OF ORIGINAL BACK ISSUES! PAGE 6**

# Backwoods Home magazine

*practical ideas for self reliant living*

Solar food drying

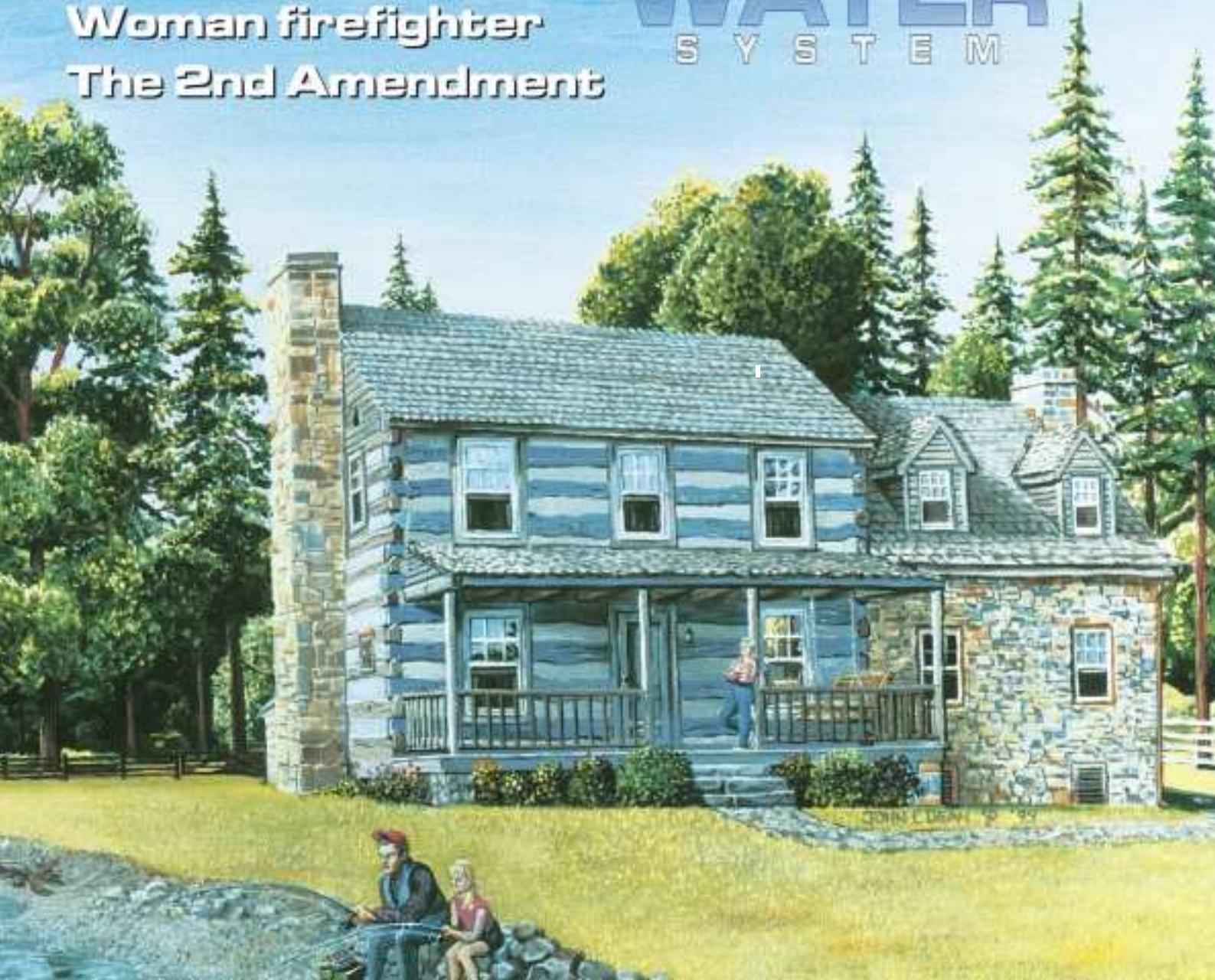
Baby tips

Woman firefighter

The 2nd Amendment

July/Aug 1999  
No 58  
\$3.95 US  
\$5.50 Canada  
[WWW.BACKWOODSHOME.COM](http://WWW.BACKWOODSHOME.COM)

THE HOME  
**WATER**  
SYSTEM



# Publisher's Note

## Win a complete set of original back issues

If you're interested in owning a complete set (at least up to this issue) of original back issues of *Backwoods Home Magazine*, we've initiated a drawing to give you the chance. We dug up a few complete sets that we had been saving for the next deep space probe and decided to give them away instead to a subscriber who has a three-year or better subscription.

If you have a current three-year or better subscription, you are eligible, or if you get a new three-year or better subscription you are eligible. The first drawing will be held July 15. We'll probably run the contest for the next several issues. Estimated value of the complete set is between \$290 (based on our back issue retail price of \$5 per issue) and \$10,000 (based on pie in the sky). The issues are in just-off-the-press condition.

## Longer articles

We've always run some pretty long articles, especially by writers such as John Silveira and Richard Blunt, but this issue has the longest article we've ever printed—Michael Hackleman's 20-pager beginning on page 8. And it's only the first of two parts. Please let us know what you think of these in-depth articles. They obviously limit the number and variety of articles we can have in an issue, but they give us the ability to treat a particular subject in greater depth.

## New bookstore hours

Our bookstore is now open six days a week, Monday through Saturday, from 9 am to 5 pm. We're not open Sunday. It's located at 29304 Ellensburg Ave., Gold Beach, Oregon. If you are coming to town for a visit, don't speed. The fuzz really enforces the 20 mph school zone near our office, the 30 mph speed zone in the rest of town, and the 55 mph zone on the highway.

## Readers Forum

The Readers Forum on our web page ([www.backwoodshome.com](http://www.backwoodshome.com)) is now the second most visited section of the site. There are dozens of conversations going on at the same time, and I've learned quite a bit from them. We couldn't begin to cover the wide variety of topics discussed on the Readers Forum. If you have a question about anything to do with self reliance, try asking it on the Readers Forum and



*The Backwoods Home Magazine Panthers*

you'll get a lot of answers. Many questions spark a debate that goes on for days.

## *Backwoods Home Magazine Panthers*

We've sponsored our first athletic team—the *Backwoods Home Magazine Panthers*, or as my son, Robby, who is a team member, calls them—The *Backwoods Home Magazine Pancers*. This is a T-ball team, that is, the kids, ranging in age from 4 to 7, hit the ball off a plastic "T" at home plate. Every kid gets to bat each inning, and they don't keep score. Sounds boring to us big kids, but if you've never seen a T-ball game, you've missed one of life's greatest and funniest events.

Our thanks to the volunteer coaches, Greg Black and Holly Chase, for teaching the kids how to run the bases, bat, and pay attention to what's going on. It's no easy chore to keep these youngsters focused on such a complicated game, especially when there are so many daisies growing in the outfield, and so many moms and friends to wave at on the sidelines.

## Sixth year anthology

We've added our new sixth year anthology to our "Best Book Deal Ever" special on page 3. That comes out to \$11.66 per anthology, which is a pretty low price. We currently have plenty of anthologies in stock.

# My view

## Why are we bombing Serbia?

Officially, the bombing of Serbia goes on for humanitarian reasons. In those words I hear the eerie echo of a news report from Peter Arnett, now of CNN, when he was a correspondent during the Vietnam conflict. Back then he reported that an unidentified Army officer explained to him that his unit had “destroyed the village in order to save it.”

But perhaps we are backing off the humanitarianism a bit. Recently the President amended his stance. He said the Balkans are where one world war started and we are there to prevent another. The Rhodes Scholar must have skipped class the day they taught what precipitated the Great War. It was started by outsiders who believed the strife that has existed in the Balkans for centuries was their business, so they chose to get involved. We are now following in their footsteps.

If Clinton seeks parallels to the World Wars, the bombing of the Chinese embassy in Belgrade is similar to the sinking of the Lusitania, an incident that helped drag the United States into WWI; the use of our latest hi-tech weapons against a country that can barely defend itself must remind those old enough to remember of the Germans testing their weapons in Spain before they set out to conquer the world in 1939. But neither Clinton nor his advisors are stupid.

They probably know these things better than I do.

So why then are we really really bombing Serbia? No one I know buys the party line, not even loyal Clinton supporters. I took a small poll among my acquaintances and asked what they think. Here are the most common responses:

- to deflect attention from China’s pilfering of nuclear secrets, a charge that would already have toppled this administration if the press wasn’t so friendly to it.
- to draw attention away from Clinton’s philandering and possible criminal behavior with women.
- to quell the fears of the military-industrial complex that is afraid that unless it is exercised from time to time, it will be downsized.
- to appease the Muslims since we seem to always side with the Jews or Christians in any confrontation and, let’s face it, Muslims control most of the world’s oil.
- to create a legacy for a President who seems destined to have his name linked to a girl named Monica, a tobacco stick, and a stained dress.

*None* I questioned think we are there for humanitarian reasons or to avert WWIII.

On a broader scale, national polls show the bombing is not popular with the American people. Almost half of all of Americans feel the air strikes are a failure, and 40 percent oppose getting involved in a ground war.

But despite the fact there is no broad public support for the bombing, there will be no Vietnam-style protests to end it. Students don’t have a vested interest this time. Because there is no draft, their lives will not be interrupted for this or any other war in which the United States has no business. It’s part of the reason we now have a professional military—to take the man on the street out of our military adventures. It’s the one enduring lesson Washington learned from Vietnam.

On the other hand, just as the American press had initially gobbled up the Washington line at the beginning of the Vietnam War (it was their guy in the White House who escalated that “conflict”), they are now swallowing the line that this is a “good war.” Will thousands have to die in the Balkans before the media has its epiphany and realizes this is just another bad war, started for vague moral reasons?

## The consequences

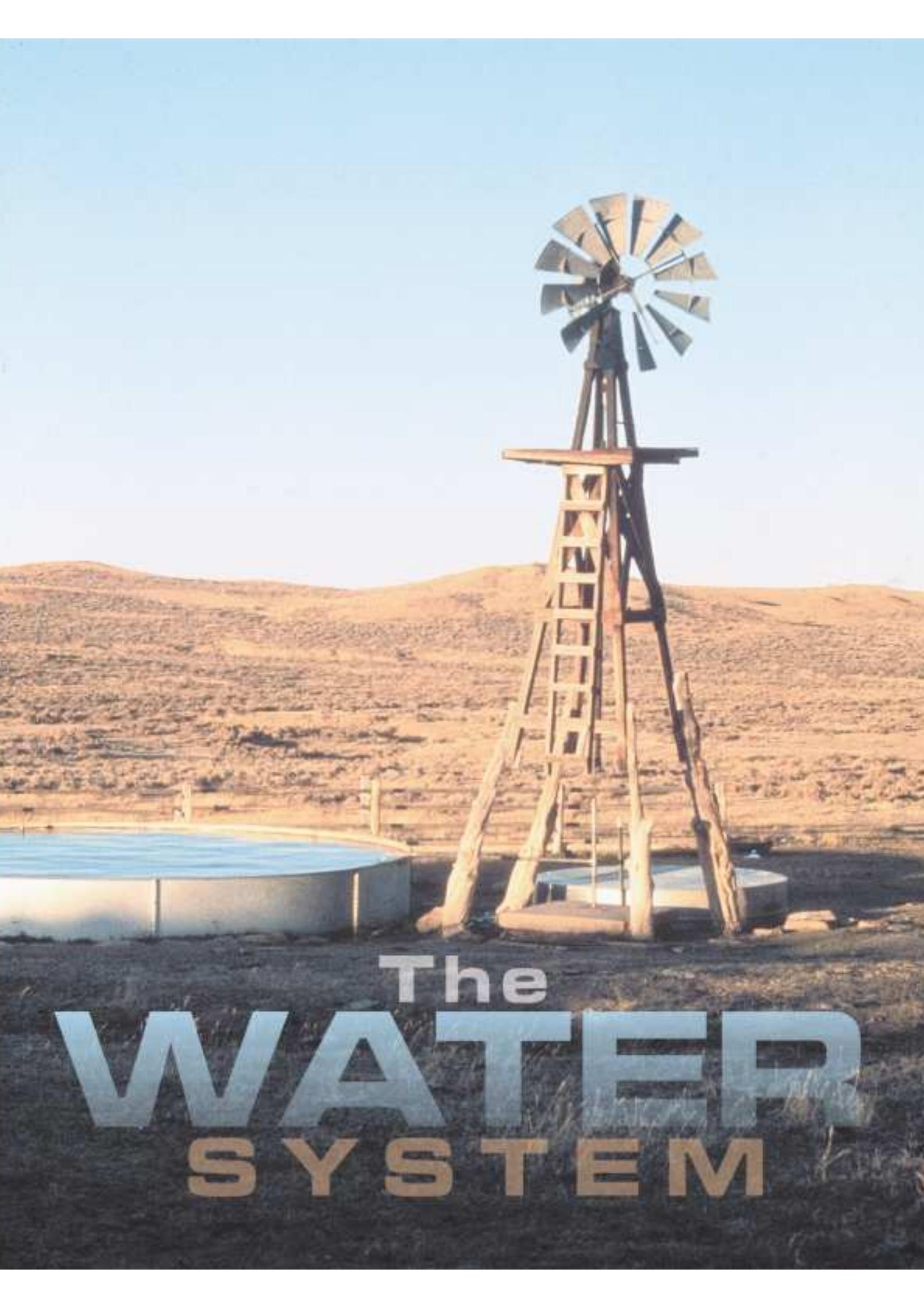
If it is our new national policy to interfere in ethnic and racial rivalries, after Kosovo we can bomb Northern Ireland, Tibet, Iran, and half a dozen African countries. We can bomb Turkey, one of our NATO allies, for its slaughter of Kurds and Armenians and its invasion of Cyprus to expel the Greeks living there. We can turn the weapons of the 21st Century on every South American country for the sake of the native populations. Then China for human rights abuses. Then ourselves for forcing the Indians onto reservations. Let the bombs fall.

I know the Administration is telling us “we have right on our side.” But make no mistake, to the Serbs the United States and NATO are no more than interventionists and terrorists. And though today there may seem to be no risk from our interfering in the internal struggles of other countries, I predict one day some Serbian, Iraqi, or other “patriot” will strike back. Anthrax released from a plane over an American or European city or a black-market tactical nuclear device set off in some truck will be just payback for our foreign adventures. We can then share the experience of having one of our cities reduced to ashes or our streets littered with the dying and dead of a biological bomb, just as we have burned other cities and left the dead and dying in the streets of countries where we had no business.

Can we stop this carnage? My guess is we can’t. The problem is that we have yet another President immersing us in yet another unwinnable “war,” and Clinton can’t find a way out without embarrassing himself. Thousands are now going to have to die at U.S. (our) hands so we (Clinton) can save face, just as millions died in Vietnam while first Johnson, then Nixon, floundered around trying not to damage themselves politically.

In the meantime, the inhabitants of the Balkans will go on killing each other long after we leave until they reach a solution on their own. Δ

— John Silveira



# The **WATER** **SYSTEM**

**By Michael Hackleman**  
**(This is the first of a two-part series)**

**U**rban-dwellers rarely concern themselves with a water system. Getting water in a home or an apartment is usually a phone call, some paperwork, and a monthly bill away. In this case, the water is simply turned on by the local water company. Or it's already on, and only the name is changed for billing purposes. Rural dwellers may experience a similar process if the habitat is located in a water district, or a water system has already been developed and is fully operational.

What awaits the proud owner of an undeveloped piece of land? If you've got utility electricity available, the local chamber of commerce will probably point you at the local well drilling company. Thereafter, you need have no more to do with the process of developing a water system than writing checks for the hardware

and labor. If the raw land lies too far beyond the utility grid, you will go through the throes of information hunting and a myriad of confusing decisions that may or may not result in a satisfactory water system.

Left out in all of these scenarios is any real thought process that will result in a well designed water system. There are functions, processes, and materials in every system. Today, where utility power is available, there is a distinct prejudice toward the demand system, i.e., one using a submersible pump. Once informed, many people will choose a store system, i.e., one using a piston pump and tank. Which is better and why?

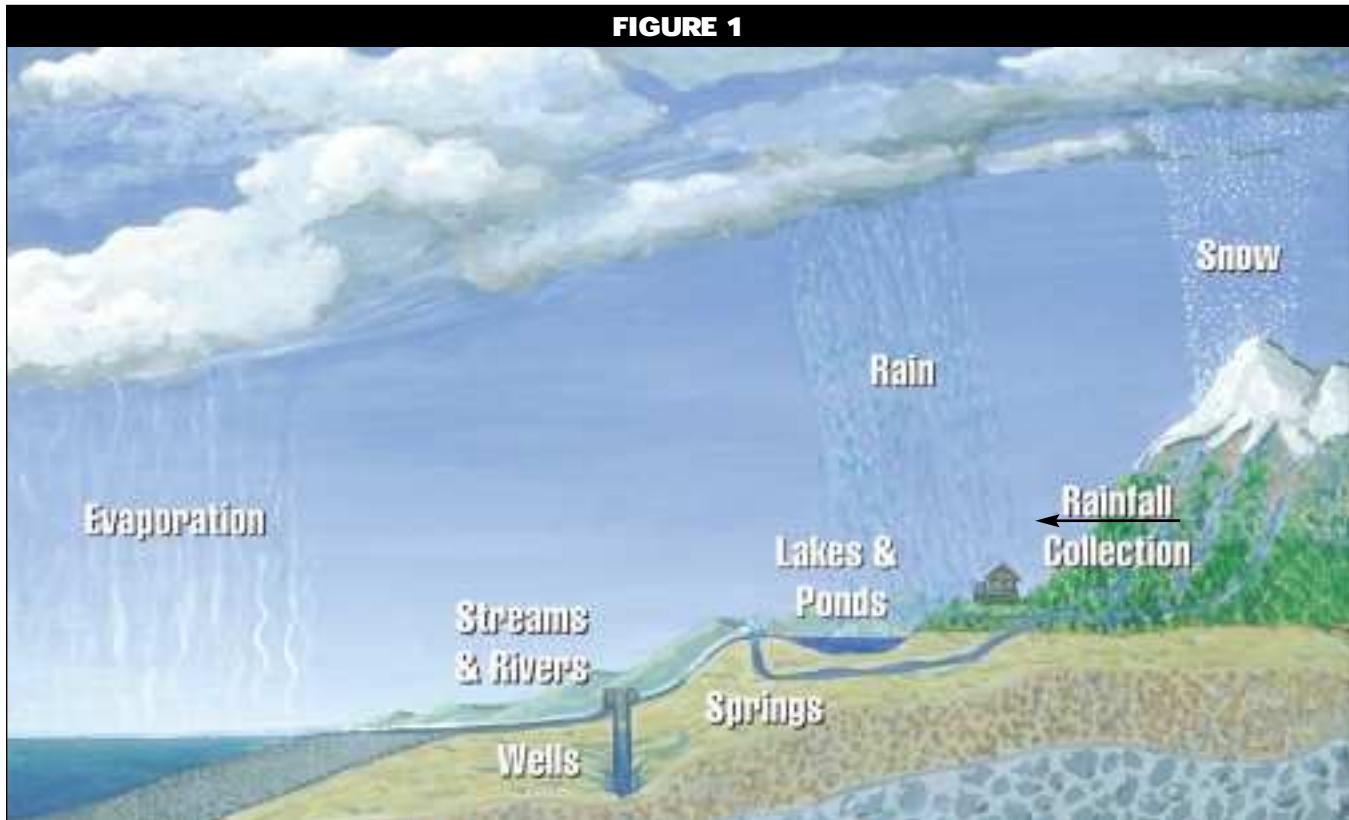
What sets the well-designed water system apart from others? Ease of use? Versatility? Functionalism? Efficient use of water and energy? The hallmark of a well-designed system is simple: it cannot be improved upon. You might find its equal but you can't find its better.

The lifeblood of a water system is the water itself. If it is to sustain you and perform the uses you will put it to, the water source must be carefully selected lest it become a source of concern. Water found in nature is "wild." Transforming it into a form that will satisfactorily do the things we ask of it requires energy. This is the system's heart. The system's energy source must also be selected so that the two, water and energy, merge in a hard-working symbiotic partnership that will demonstrate again and again how wise it was to expend the effort toward this end. Let's look at sources of water, sources of energy, and the components involved in processing water itself.

## SOURCES OF WATER

There are many potential sources of water for use in the rural water system (**Fig. 1**). Among the more promising sources are streams, springs, ponds,

**FIGURE 1**



There are many potential sources of water.

**FIGURE 2**



A shallow well may be dug with a backhoe.

and wells. It is even possible to collect the falling rain.

Access is everything. Right off, some of these potential sources may be eliminated from the list; you either have them or you don't. Some sources can only be listed as "probables," particularly if there's no visual evidence of their presence. The extremes are interesting. It would be just as rare to find a piece of property that boasted all of these sources as one where none of them existed. So it's safe to start with the assumption that there is at least one source available to any piece of land and a strong possibility of more than one.

Each source of water is unique. But if it is to find a place as the source of water for a water system, it must pass a test. It's not difficult to list some of the questions we would be likely to ask of it. However, let's first look at some of the characteristics of each source that both define it and help distinguish it from the other sources.

**Rivers and streams:** Rivers and streams represent a good source of water. Streams tend to vary more in

flow rates, helping shed immediate rainfall, whereas rivers typically display a delayed runoff of rain and are fed by a seasonal release of water locked in snowcaps or glaciers.

All rivers have their birth as streams and creeks, so size is the basic difference between a stream and a river. The sheer number of streams needed to supply one river indicates the higher probability of finding a stream on a piece of land than a river.

**Springs:** Springs are magical water flows from the ground, in a trickle or a copious flow of unusual clarity and purity. The actual source of the water varies. It may be the reemergence of a stream that has gone underground. Quite often a seasonal stream is only a portion of an underground run of water that, because of sheer capacity, sometimes shows itself aboveground as overflow. Springs may also be the result of a tear in the fabric of the water table itself, when internal pressure "bleeds off" the excess water. In particularly dry regions, the water in some springs may come from a very great depth.

**Lakes and ponds:** The flow of water in a river or stream may be temporarily interrupted by large depressions in the ground which must be filled before the journey is again resumed. If it's a big depression, we call it a lake; a smaller one is simply a pond.

Sometimes a lake or, more frequently, a pond is not supplied just by a stream or river. In fact, it may receive a major portion of its water from a spring. There are a number of ways to determine whether this is the case. If a pond is one of several water sources available to you, you may want to defer some decisions until you've positively established the pond's true source of water.

**Shallow wells:** So far the discussion has centered on natural water sources (although it is possible to build a lake or pond). However, if the water is not so readily accessible, a

shallow well is one way to get at it, particularly if you know it is just below ground level. And while a shallow well can be dug with machinery, it also can be hand dug. Traditionally, a shallow well may be 3 to 4 feet in diameter (**Fig. 2**). Because of the extreme danger to the digger in the event of a cave-in, these wells are limited to a maximum depth of 25 to 30 feet.

**Deep well:** A deep well may be needed to reach groundwater. The range extends, for our purposes, from 25 feet to several hundreds of feet. Wells to several thousands of feet are not uncommon, but at the going rate few private individuals could afford to drill to such depths.

The diameter of the hole that's drilled to reach water is as varied as the depths to which one might need to drill to reach water. Naturally, the larger the hole, the higher the cost. But while small and large holes alike can reach water, the difficulty of extracting it (or housing the equipment designed to do this) increases significantly as the diameter drops below 6 inches. A compromise is indicated. It will be easier to find the optimum diameter once a water-extraction system is selected and size of the equipment available from local well-drillers is determined.

**Rainfall:** Precipitation initially supplies the water for streams, rivers, lakes, ponds, springs, and wells. However, in whatever form—rain, snow, hail, sleet, or condensation—rainfall is a potential source of water in itself.

A clue to the means whereby rainfall can be tapped as a water source is supplied by nature. Streams and rivers, at the persistent urging of gravity, channel the runoff from rainfall to lower elevations. Damming one of these sluices is, in effect, a means of rainfall collection. Another crude but inexpensive way to duplicate this effect is to dig a trench across a slope in the path

of runoff, terminating the lower side in some type of storage.

Serious collectors of rainfall are both practical and innovative, merely channeling rain shed by rooftops and their edge-mounted gutters into storage such as a cistern for later use. A surprisingly small amount of roof area will yield thousands of gallons of very clean water each year (**Fig. 3**). Rainfall measurements are taken by a number of agencies and records extend back for fifty years or more. Using these figures and allowing for a 20 to 30 percent loss due to splashing, overflow, and initial washdown of the rooftop, a remarkably accurate determination of capacity may be assessed for any rooftop.

**Combining sources:** There is a strong tendency in the United States for individuals to establish one strong source of water at a particular site and, damn the expense, set up the entire water system around it. This approach to water-system design is understandable. However, many areas don't experience such hardy water sources. And where they exist, the supply diminishes as populations expand and the use of water increases.

Given the diminishing availability of pure water sources, the notion of "one source, one system" becomes both foolish and dangerous. It's foolish because most situations have access to at least two water sources. It's dangerous because single-source systems are inherently vulnerable to the possibility, however remote, that the source will dry up. Even a temporary stoppage can be trouble for a system that has made no provisions for such an event.

## Evaluating sources

Each source of water has inherent qualities and limitations. Decide which is an advantage or disadvantage to you.

**Access:** Access implies on-site presence. While much may be hidden

from the eyes, if you don't have it, you don't have it. Relative to streams, ponds, and springs, a walk of the land will quickly reveal whether they're there or not. If they are, list them as probables. The same goes for any source that is intermittent, such as seasonal streams. However, don't confuse "don't know" with "definitely not." For most properties, the evaluation of this single criterion access will cut the list of possible water sources in half.

**Ease of development:** On a scale of one to ten, make a preliminary evaluation of the relative ease or difficulty of developing any probable water sources. In a way, this is an availability rating. If you can walk right over and scoop it up, it gets a high rating. If you don't know, give it a question mark.

**Water and the law:** Access to, and availability of, water is not equivalent to the legal right to use it. Just because a stream flows through your property does not mean that you can take any of it for any purpose you wish. In some instances it may be permissible to take the water for household use or for a small garden, while other usages such as irrigation of fields, watering of livestock, and power production may be prohibited. In some places, this may even apply to a spring that starts on your own but that passes over the property line.

Legal use of water is defined as "riparian," "appropriative," or both. The first acknowledges the need to share water, and the second is "first come, first served." It's beyond the scope of this article to cover all of the possibilities in sufficient detail. But it's up to you to fend for yourself. Water rights are not always clearly designated in the property deed, nor are they automatically part of the title search that commences once a property is in escrow. Little wonder, then, that people buy a piece of land only to discover sometime after the sale that their right to the water on their land is

**FIGURE 3: Net yield of water for cisterns per square foot of catchment area**

| Minimum annual rainfall (inches) | Water yield per sq. ft.* (gallons) |
|----------------------------------|------------------------------------|
| 10                               | 4.2                                |
| 15                               | 6.3                                |
| 20                               | 8.3                                |
| 25                               | 10.5                               |
| 30                               | 12.5                               |
| 35                               | 14.6                               |
| 40                               | 16.7                               |
| 45                               | 18.8                               |
| 50                               | 20.8                               |

\* Adjusted for 30% water loss due to leakage, splash, roof washdown, and evaporation

Rooftop rain collection is used worldwide.

restricted or prohibited. For this reason, any property that has an unusual abundance of water that has not been developed should be treated as suspect in this matter. If you want to make some use of the water, make its legal use part of your conditions of sale, or keep on looking.

**Contamination:** All surface waters are subject to pollution. Airborne pollutants brought down by the rain. Fecal matter from animal stock, camper owners, and improperly installed and maintained septic systems. Minerals washed from tailings (the material left over from mining operations). Logging. Roads. Landscaping projects. And others. The probability of contamination is higher with each passing mile.

Lakes and ponds are in the same predicament as the rivers and streams that feed them. However, unlike their nomadic cousins, their still waters are not always able to pass the problem on downstream somewhere. Instead, the suspended material precipitates and coats the bottom. Left undisturbed, the polluted material is quickly covered by other suspended material. However, if the inrush of water feeding the pond or lake normally stirs up

the sedimentary layers, watch out. Those who harvest the rich silt from seasonal ponds should take note. They may get much more than they bargain for.

Springs and wells are least affected by contamination, even though their water percolates down through the soil from the surface. The soil itself is an excellent filter. In fact, the water doesn't have to go very far at all. With some soil types, a few feet is sufficient to remove most of the contaminants. For this reason, water from springs and wells is some of the purest available. However, this water is also exposed to mineral deposits, and other substances. Their concentration in the water may exceed levels acceptable for human consumption.

Collected rainfall is also quite pure. The first few minutes of rainfall should purge the air through which it passes of contaminants. Furthermore, this same water will flush the actual collection system (a rooftop?) of any other particulates. But, while this

source altogether bypasses the type of exposure experienced by streams, rivers, ponds, lakes, springs, and wells, it is also devoid of the beneficial trace elements found in these sources. If used as the only source of drinking water, its sterility actually could be unhealthful.

These are relative indicators. Until proved otherwise, water from any source should be considered suspect and tested. If need be, it should be treated for the presence and relative concentration of a host of elements, minerals, pollutants, and bacteria.

Any source of water exposed to the open air may also be contaminated by nuclear fallout. Whether it's from testing or an actual war or the failure of a nearby nuclear power plant, the effect is the same. Naturally, rivers, lakes, streams, and ponds are easily contaminated by fallout. Again, springs and wells are the least affected. However, a big part of this is "cover." An open spring box, open storage of well water, and a rooftop system for rain-

fall collection defeats the natural protection of these sources from contamination.

**Proximity to usage:** A potential water source should be rated according to its distance from the point where the water is needed. This evaluation assumes that the building site has already been established. If it has not, pick some "possibilities" and evaluate the potential sources accordingly. Precise distances are not required. A simple comparison between two or more sources is sufficient for now. In the final analysis, it's conceivable that developing a less accessible source closer at hand may be preferable to the cost or relative difficulty of transporting water from a readily available water source.

**Elevation:** The elevation of each water source relative to the usage site should be noted. It takes energy to move water. If the water can move itself via gravity flow, all the better. So, higher ratings go to sources that are higher than the usage site. This is

### SIDEBAR A: MEASURING A WATER SOURCE'S CAPACITY

**M**easuring capacity is rarely a difficult task. However, such a measurement represents an instantaneous reading. Measure it later-by the hour, day, week, month, half year, or year-and you're likely to come up with as many different values as the actual number of readings taken. Why?

Simply stated, capacity varies. Rainfall, snowpack, seasons, drought, or unusually wet periods influence capacity. So do earthquakes, evaporation, seepage, increased usage, and higher population densities. No water source is exempt from the effects of some of these conditions. Minor fluctuations are of no concern. The variance in the readings one will obtain from any one source over a period of

time, however, is evidence enough that we're not talking about insignificant differences.

If we took the readings at regular intervals over the span of a year, we'd know both the minimum and maximum values of capacity. A fail-safe tactic then, is to build your system based on the lowest figure obtained. Another tack-basing your system on a capacity figure halfway between the minimum and maximum readings-makes more sense, but it introduces an element of risk. Voluntary conservation may be needed during the drier portions of the year. A saner and safer course might be to select a rating closer to the minimum and between one fourth and one third the maximum.

It is impractical to wait long enough to take readings over a peri-

od of a year just to obtain figures and then extrapolate a reasonable design capacity. A faster means of obtaining a sound answer is to discover exactly what factors are responsible for the variance in the capacity of any water source. This has a fourfold effect. One, it helps select the best time to take the reading. Two, it indicates what can affect the accuracy of the reading. Three, it permits adjustment of the reading to a figure useful in system design. And four, it indicates what can affect the specific source(s) you use. This assures a quick response to a crisis and implementation of conservation techniques or alternate water sources. It beats waiting until the effect is felt and it's too late. A fish has no exclusive claim to being stranded high and dry.

relative. A high-elevation water source that is too far away, is not in line of sight, or is traversed with gullies or other inhospitable terrain is less appealing. Approximate these elevations above or below the level of the usage site.

**Capacity:** Any water source has a capacity. This refers to the maximum amount of water it will deliver under any condition. It's usually described in some convenient term such as gallons per minute (gpm) or gallons per hour (gph). Depending on the source in question, there is always some means of approximating or measuring the source's capacity (**Sidebar A**). Let's look at the factors that may affect the capacity of the water source. This includes the measurement, usage, evaporation, seasonal variation, rainfall, and other factors.

**The measurement.** Always choose as large a time frame as permissible—anything timed in seconds, or portions thereof, includes a larger degree of possible error than something timed for half a minute or more. Then, no matter what pains you took to do it right, repeat the measurement. An accurate reading is a repeatable one.

**Usage.** A variance in capacity may be attributable to a variance in the use of the water. How many times have you heard someone claim that there's less water available during the summer than in the middle of winter? There are other factors that affect this, but one that's frequently forgotten is that there's a greater need for water in the summer for cool showers, the watering of orchards and gardens and such than in winter. This doesn't constitute a real change in capacity, but it sure feels like one.

An influx of new residents in the immediate vicinity will inevitably bring about a greater usage of water, decreasing the supply of some sources. Or there may be very little change. Even a new well or spring development nearby will not necessar-

#### SIDE BAR B: LOSSES DUE TO EVAPORATION

**U**nder the worst possible conditions—very dry air, lots of wind, a hot and sunny day—the amount of water lost to evaporation is actually measurable. To see this, find a pond and stick a ruler in the mud. Take a reading in the morning of a high-evaporation day and another that evening. I've measured a  $\frac{1}{4}$ -inch loss in one day strictly from evaporation. (This test assumes that no other water is being taken from the pond.) With a big pond, it adds up quickly. For example, with a circular pond 50 feet across, a  $\frac{1}{4}$ -inch drop adds up to 306 gallons lost per day. That's 2,140 gallons a week—in one month, 9,200 gallons sucked up by evaporation. It doesn't take many months to dry up a pond at that rate.

ily tap your own supply. At worst, the water table may drop and a stream dry up. Depending on the types of water rights in your area, you may or may not be able to do something about it. More drilled wells in the immediate area will inevitably lower the water table further, and your well could dry up. Unfortunately, subsurface water is not nearly so well protected in a legal sense as streams or rivers may be. The difficulty of proving that any specific well is responsible for the loss of others is obvious.

If you are still in the developing stage, this might be a case against a spring or well development. Is there a potential for a lot of new wells or a few high-consuming wells (as for industry or business) in the vicinity in the years ahead? Naturally, the smaller the parcel of land, the higher the probability of some effect from a neighboring well near the property line. Sitting snugly in the middle of even a piddling forty acres is buffer enough against interference in most instances.

**Evaporation.** Water left standing in the open will be sucked up by the air as water vapor. This is called evaporation. The rate at which water evaporates depends on the dryness of the air, the temperature of the ambient air and water, the amount of water exposed (the surface area), and the amount of air movement (wind speed). If this is the source for a water system or the storage for water taken

from other sources, evaporation must be taken into account in estimating its capacity (**Sidebar B**).

Water standing in spring boxes, wells, covered tanks, or cisterns (closed reservoirs) also experiences some losses due to evaporation. However, since less air is in contact with the water under these conditions, smaller losses are incurred.

Spring and stream-fed ponds and reservoirs may show little capacity variance due to evaporation losses, as these may be offset by input. On the other hand, ponds or reservoirs that are filled by a seasonal stream must hold their own against losses other than normal use, such as evaporation or seepage. In these cases, evaporation becomes a critical factor.

There's little one can do about evaporation from an existing pond. A new pond, on the other hand, can be designed to minimize losses. Start with the pond's shape. It should be relatively deep in proportion to its surface area. Retaining the volume but halving the surface area will halve the evaporation losses.

A second tactic is to site the pond out of the direct rays of the sun. Taking advantage of shade trees or natural shading from hills will help. Know the sun's path through the sky during the summer months. If natural shade is not available, build it. If it's too expensive to shade the reservoir altogether, erect a structure that will

shade the water for at least a portion of the day.

If nothing else, knowing the effect of evaporation should indicate the futility in simply damming up a section of a creek in the merry belief that this is an automatic guarantee of water through the hot summer. And, as the levels sink, you won't be lured into an assumption that it's "seeping away" and throw more money into solving that problem. Of course, you could be losing water both ways—to evaporation and seepage—but each inflicts losses that no conservation techniques will dent.

**Seasonal variation.** A dry creekbed in the middle of summer may be a raging stream during winter. Measuring the level of water in a well will invariably lead to higher readings in the dead of winter than those taken in the fall. That comes as no surprise to most people. Winter may bring cold and misery, but it also brings precipitation. In the form of sleet, rain, hail, or snow, it's still water. And as the water makes its way over and into the land, the water table rises, the creeks begin to flow or flow more profusely, and ponds fill.

Any measurement of capacity must take into account the season in which it's taken. A water system designed around a reading taken at the end of summer is never going to want for water. A system based on a reading in the spring of the year may find itself in trouble by summer's end.

How much difference will exist between the two readings? Unfortunately, it's too situational to generalize. The capacity rating used for system design will probably be something below the average of these two readings.

Fortunately, we don't always have to be exact with these figures. It is helpful to have some numbers for system design, but we must not lose sight of the fact that capacity does vary. Inevitably that means that sometimes there will be too much water and at

other times too little. A good system can easily handle the rare instances where there's too little source capacity. It's a versatile system that is able to make use of the instances where there's "extra" water.

One limitation of end-of-summer capacity measurements is that the source may have just temporarily run out of water. An otherwise good source of water may be hidden. Don't be put off by a really low reading. Besides the fact that it's the reliability of the source that's important, take some consolation in the fact that the reading you've obtained probably represents the lowest it will ever be.

**Rainfall.** While winter is normally characterized by an abundance of water and summer by a lack of it, rainfall occurs in varying amounts throughout the year. So rainfall at other than seasonal times is a bonus and its absence a penalty to some water sources. Few water sources will note a measurable difference in capacity from a light rain, even if it's over a period of several days. If the rain is heavy, however brief it may be, the ground may not absorb it rapidly enough and runoff will occur. In this event, even seasonal streams may flow and ponds will fill.

This event should be treated solely as a bonus to a system—if it's able to capture it. This bonus will permit an extra ration to the garden and a long shower for yourself. However, no system should be designed around such a chance occurrence. Accordingly, whenever a measurement of capacity is taken after any such freak event, the reading must be adjusted accordingly.

Cloudbursts and heavy rainfall runoff may be considered for their water potential, in addition to a system's own reliable water source, if they occur often but aren't predictable enough to depend on. Here the gain must be weighed against the cost of establishing some means of collection, and possibly storage, of the runoff.

Since heavy runoff is characterized by turbidity (suspended particles like silt, organic materials, etc.), a secondary storage setup is recommended, even if it's only temporary. This recognizes that while filters to eliminate water turbidity do exist, the best overall means of controlling this condition is to let the water "pool." Once immobilized, the suspended particles will simply settle to the bottom of the holding tank.

Springs and wells are unlikely to experience any immediate increase in capacity due to rainfall. If the rainfall is short-lived and comes down hard, there will be no increase, since the water will escape along the surface. A long, slow rainfall will raise the water table, but it will take time for the water to reach it through the earth. Any measurements from either a spring or well that are taken a few days to a few weeks after a long, steady rainfall may affect a capacity measurement. The reading should be adjusted accordingly.

**Other factors.** Other factors will affect either capacity or our measurement of it—earth tremors, leaks in the system, etc. The intermittent nature of any wildly fluctuating water source motivates people to seek other, more reliable sources. But in the cost/benefit ratio taking into account such factors as dollars, time, skills, knowledge, reliability, simplicity don't rule out extensive or occasional use of variable capacity sources. No source is a guaranteed, long-term thing.

Fortunately, anything that might affect capacity only influences some of the potential water sources at any given site. Therefore a multiple source water supply is preferable to one seemingly strong source. If nothing else, permit options in the final design and sketch out a few details for connecting up to an alternative source should you need to. A preplanned course of action in an emergency is a whole lot better than merely reacting to the situation.

**Specific uses:** We'd all prefer to have grade AA water or better, but with the sources available to us that may not be possible. Water purification beyond some token filtering is costly, complex, and difficult to maintain, and should always be avoided. Too often a water source that's only slightly tainted is crossed off the list in favor of one that delivers purer water at a significantly higher cost in development, transportation, or complexity.

A large part of the difficulty in this thought stems from a tradition lumping all of our water uses together as needful of the same level of water purity. That is, we demand drinking water quality in the toilet!

Understandably, we will want a high level of purity in water used for drinking, cooking, dishwashing, bathing, and some gardening. Other needs—agricultural, watering stock animals, washing clothes, treating sewage, watering lawns, washing cars, storage in case of fire, and so on, do not require perfect water. The two groups overlap and may even be separated into other “shades” of water purity. Only the ready availability of pure water has prevented more extensive implementation of “graywater” systems.

Other than the cultural stigma attached to graywater use, the main objection to multiple uses of water has been the need for duplication of pipe runs and sufficient planning to ensure that the various levels of water do not unwittingly merge. For existing systems requiring retrofits, the objection is valid. However, for new systems the cost of the extra material and designwork is very competitive with the higher need for water and the energy required to pump it from supply to use. Since pure water sources are decreasing and the cost of energy is increasing, a system that favors low water use (characteristic of multiple use systems) also uses less energy.

**Cost:** So many of us have taken water for granted so long that when it

comes time to shell out some money for a water system, we're shocked at the cost—we might be talking about thousands of dollars! Striving to keep the costs to a minimum is natural, and any system should be cost effective. However, it's unwise to concentrate too long or heavily on cost right away. Otherwise, we end up letting this factor lead us through the myriad of decisions, and down the line we end up paying for it in some other way. Maybe the ultimate cost will be too high in intangibles—dissatisfaction, for example, or time and worry, adjustments in lifestyle, a lack of versatility in the system. Sometimes, though, we're talking about hard cash repairs, refits, modifications for every little new thing that's added to the system, extraordinary maintenance, the cost of consumable materials such as filters and chemicals, those monthly energy bills, etc. Rarely do our troubles stem from ignorance; too often, we know these things exist. If we had the power really to minimize them as effectively as we're able to convince ourselves of their supposedly minimal effect, we'd have something.

Good design can significantly reduce the impact of the initial cash outlay for a system. For example, an honest appraisal of what's needed right now and what can wait until later gets things going with a reduced cash outflow. Planned “add on” always costs less than modifications that weren't anticipated from the start. Another merit of this approach is that it permits a “weathering” of the system. Changes do occur, so the water system you design may have a different feel once you start living on your land a year from now. People change, situations change, and both affect the system. A wise course of action takes that into account. Design it, build the portion you can afford, and build in sufficient leeway for changes as they're needed or when you will have the money. You get what you pay for. Remember: the bitterness of poor

quality is remembered long after the sweetness of low cost is forgotten.

## **ENERGY SOURCES**

As with anything that has weight, if we want to move water from one place to another we must use energy to do it. Individual water systems have individual energy needs. Very few are lucky enough to require “no” energy, and some are unlucky enough to require energy at every step—extraction, transport, pressurization, and storage. Water that required one or more of these steps to be converted from standing water into useful form for household or farm use is said to be processed.

Let's look at the variety of energy sources that may be set to work processing water.

**Gravity:** Whenever and wherever water is high enough to let gravity do all the work, let it. Sometimes, even when it isn't high enough, it pays to go out of your way to give it this potential for the benefits it yields over the energy expended in the effort. More on this later.

**Human muscle power:** Water may be processed by human power. This takes two forms. One is through use of the bucket, where a person scoops up the water and walks from the water source to the point of usage. At the rate most families use water today, this would prove labor intensive. However, the idea has some merit, and should not be rejected outright. The initial investment is small (one bucket) and the exercise alone should keep anyone fit.

Human power can also transport water through the use of a pump. The hand operated pump standard has been around for a long time, and it's guaranteed to give you strong arm muscles along with the water. A variation on the theme is a pedal-powered water pump. Legs are more powerful than arms, and through suitable linkage the leg muscles may be put to work

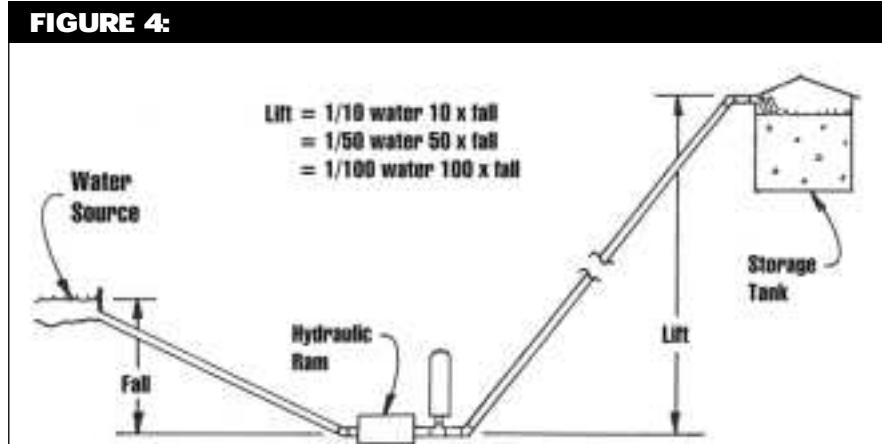
pumping water. Admittedly, for all that pedaling the scenery doesn't change much, but at 100 gallons to the "mile," who's complaining?

**Animal power:** Prior to the use of fossil fuels, physical labor beyond the capacity of the ordinary man or woman was done by beasts of burden such as horses, oxen, or goats. This is still a good possibility for pumping water wherever any of these animals have been reintroduced to the farm or homestead. However, considering the amount of feed these critters can consume, centering any water system totally around animal power is a doubtful possibility.

**Fossil fuels:** Another popular energy source for processing water is fossil fuels. Initially only oil was available. Its use was limited to centralized facilities where oil burning turbines drove generators, producing electricity that was, in turn, transported over wires to the usage site. Once there, the electricity could power electric motors that would supply the needed mechanical motion to operate pumps of various types. Fossil fuels in the guise of utility-supplied electricity are probably the number one source of energy for water systems in the U.S.A. today. High density fuels—propane, diesel, kerosene, and gasoline—derived from fossil fuels may also be purchased for engines powering onsite water processing equipment. However, the cost and noise factors usually limit this usage to backup systems for use only during emergencies when the primary system isn't functioning.

**Waterpower:** Moving water is also an energy source, whether it's a river or a waterfall. Either way, this energy may be captured by a variety of novel mechanical or electrical devices. In turn, these will pump a portion of this water (or water from another water source) to places far away or higher up anywhere the water would not flow of its own accord.

**FIGURE 4:**



The hydraulic ram is a water-powered water pump.

The simplest device available is the hydraulic ram (Fig. 4), which uses the energy of water to pump a small portion of the water to a higher point. Theoretically, the hydraulic ram will pump 1/10 of the water 10 times as high as the waterfall, 1/100 of the water 100 times as high, and so on. Pump inefficiencies reduce this amount somewhat. If a landowner has access to a river but either has no legal right to use any of its water or chooses not to, the dual-acting hydraulic ram is useful. It uses the energy of the river's water to pump water from another source such as a spring or well to the appropriate place.

Waterwheels and turbines will also pump water directly. More often, however, they are connected to other devices that supply mechanical energy or, in the case of generators, electrical energy.

**Natural gas:** The decomposition of organic materials under certain environmental conditions produces natural gas. At the utility company level, this gas is often processed to produce propane, which has a higher energy yield per cubic foot than natural gas and is easier to liquefy.

Back on the farm, natural gas may be produced from animal or agricultural waste in a digester. Methane ( $\text{CH}_4$ ) is the desired end product, but it is produced in company with other

gases and substances. In this mix, it's called bio-gas. Detectable amounts of bio-gas may be produced from a remarkably small amount of organic material. For application in a water system, sufficient bio-gas must be produced to power a small internal combustion engine. This in turn can operate a water-pumping mechanism or produce the electricity to power a motor that will drive a pump. This requires an enormous amount of animal or agricultural waste. Nevertheless, where the right conditions exist, the production of bio-gas is a viable alternative to on-site energy sources for small, engine-driven water pumping functions.

**Wind power:** Another major source of energy for water processing systems is the wind. Here, one of several types of wind machines extracts the wind's energy and converts it into the mechanical motion needed to work a water pump. If there's a problem with this setup, another type of wind machine can be used to produce electricity to power a motor connected to a water pump. As far back in recorded history as you'd care to go, wind has been harnessed to pump water. In some areas the wind is both constant and strong enough to guarantee water processing around the clock, but this is rare. Any system that uses the wind's energy for water extraction and

transport must be equipped with sufficient storage to satisfy demand during periods of low or no wind.

In the 1800s there was a definite need for water pumping in very remote areas for livestock and agriculture. To meet this need, private companies developed wind machines that were simple, rugged, and virtually maintenance-free. Even the later introduction of electrically powered motors and oil, kerosene, or gasoline engines could not stem this industry. After the initial investment, there is no further operational cost with a wind machine. Closer to the farmhouse, these wind machines did yield to the high capacity electrical pumps. The mere presence of the old towers and windmachines today is proof enough that the farmer or rancher wasn't inclined to let them go altogether. Even in disuse, these reliable machines are hard to part with.

## Selecting energy source

Each potential energy source—gravity, muscle power (human or animal), fossil fuels, natural gas, water, or wind—should be evaluated in terms of energy needs, reliability, availability, access, independence, complexity, and cost (initial and ongoing). If you have no prejudice in the matter, this becomes a straightforward process of elimination, followed by a simple choice if more than one source emerges unscathed. If you do have preferences (most of us do), this process may help you select a secondary, or backup, energy source. Is that necessary? Judge for yourself.

**Energy needs:** A prime factor in selecting an energy source is its ability to handle our system's needs in processing water. Irrespective of how much that amounts to, you want to keep this to a minimum. A system's need for energy is ongoing. Since energy in any form costs something,

both dollars and "sense" dictate using as little as possible.

Now is as good a time as any to introduce the Concept of TANSTAAFL. That's short for "There ain't no such thing as a free lunch." Don't expect something for nothing. No energy source is free. What about gravity? True, gravity is everywhere. Yet, if the water source on the property is too low relative to the usage site, you can't put gravity to work unless you first expend some other form of energy to lift the water high enough for gravity to take over. If your site doesn't permit you to take direct advantage of gravitational energy, one fact emerges: you have a lot more energy sources to choose from if you can keep the system's energy requirements very low. Water pumping wind machines, for example, will suffice even in areas of very low wind. They're designed to operate at low wind speeds. This advantage is lost in energy intensive systems, as would be the case with muscle power, methane, and small scale waterpower developments. All too quickly, energy sources available onsite are lost in the "big energy" shuffle.

**Reliability:** Reliability is, first and foremost, not having to worry about the system. Open a faucet and you should get water. If the storage tank is low, either it is filled automatically or, through a monitor, you are informed when refilling is needed. Reliability is also continuance. Everything wears out sooner or later, but frequent breakdowns are a symptom of a problem.

Reliability doesn't just happen. If this factor isn't built into the system in both its design and equipment, it's doubtful that it will be exhibited during operation. How do you design for reliability? That's easy—follow the kiss principle: Keep It Simple, Silly! A system is no better than its smallest or weakest part. If you skimp on any aspect of the system, it's going to get you.

Reliability is increased as the number of energy conversions and transfers involved between the prime mover (energy source) and the application decreases.

Let's compare two systems. In System A, a water pumping wind machine converts the wind's energy to mechanical energy (rotary motion) and then into a reciprocating action (up and down motion) which, via a long rod, works the water pump. This amounts to one energy conversion and two simple energy transfers. In System B, the water system is based on a submersible pump powered with utility supplied electricity. How many steps are involved? Since most of this electricity comes from oil or coal burning power plants, the coal or oil must be found, extracted, processed, transported to the power plant, and burned. The resultant heat produces steam, which drives turbines coupled to electrical generators. The manufactured electricity travels through power lines to your land, where it drives an electric motor which in turn operates a pump. That's six energy conversions and four energy transfers.

Now, I ask you which system, A or B, is likely to be more reliable?

**Availability:** Availability has a time frame. What has been available in the past and is now may not be available in the future. Many people don't like to think about that—it smacks of doomsday—but there's no avoiding it. The world is running out of oil, natural gas, and coal. The experts may not agree on when our supplies of these natural resources will be exhausted, but it will happen. This is the time of plenty, and chances are pretty good that it won't happen in our lifetime. However, long before the fuels run out, the ripples of the shortage will make themselves felt.

**Independence:** An offshoot of availability is a personal decision involving independence. However gregarious we are, most of us would like to gain control of our individual

lives. The convenience of utility supplied electricity, then, might be shunned for the independence to be gained by using available on-site energy sources to which no meters are attached.

Independence comes when you take on the responsibility for the system—its maintenance, correct operation, and at least minor repairs.

**Complexity:** The connection between reliability and complexity has already been established. Complex systems seem easier to operate than simple ones. Why? Essentially, automation takes the burden of decision making away from the human user. Given the sheer number of factors at work, to choose the correct response for any given set of circumstances requires an extensive monitoring and control setup.

There's nothing inherently evil about complexity. Any increase in vulnerability arising from the number of parts is easily offset if the owner/operator understands how it's all supposed to work. Supposedly, then, it's easy to troubleshoot and isolate malfunctioning components. This makes the individual an integral part of the system.

The alternative is to set up a simple system and retain the decision making aspect yourself. Certainly the fewer the component parts, the less there is to go wrong. I prefer this approach because it keeps me in touch with my system. A side effect of this involvement is that I'm apt to notice a problem that can be fixed before it results in a breakdown or requires the replacement of an expensive component.

**Cost:** It's sometimes difficult to separate the energy costs from the system costs. For example, the use of some variable, intermittent, or low yield energy source demands a provision for water storage (tank, cisterns, etc.). However, there are other reasons that might prompt an individual to use a storage system. Or to install a much

larger size than what's required for simple utilization of the energy source itself. Without getting into actual dollars and cents, we can establish a few associations. One concerns the initial cost versus the ongoing cost. Utilizing available on-site energy sources such as wind energy and water energy seems at first prohibitively expensive. All the money is up front. By comparison, a utility powered submersible setup comes with a lower initial price tag. However, there's a string attached. It all runs on specialized energy that must be purchased in monthly installments. The "string" is suddenly an umbilical cord. Water systems based on renewable (independent) energy generate their payoff in dollars saved through the years.

It was an enlightening experience to rebuild my water pumping windmachine and be told that the last time the company made a major change in the design was 1933! What does this have to do with costs? If you're to spend hard earned dollars on equipment, it's nice to get built-in quality, ruggedness, and craftsmanship. Even several generations ago, the workmanship was superb. Manufacturing dollars spent on equipment of an older design go into materials. Newer equipment must pay off tooling, designwork, and advertising to inform the public that the product exists.

**Multiple energy sources:** Just as it's good to have more than one water source, it's good to have more than one energy source.

Any energy source or service can suffer a temporary interruption. How well the system will fare during this period is a matter of design and luck. Minimizing the "luck" part is, of course, desirable. Systems that apply all of their energy to processing water in such a way that it may thereafter assume energy-free (gravity) flow and pressurization are prepared for such eventualities. Some owners may find the price tag for this brand of security a little steep.

An alternative is the system that utilizes two or more energy sources. While either may be interrupted at any time, the probability that they would both disappear simultaneously is mighty low. Add a third energy source and you can bet your nest egg that you'll have at least one of the three sources operational at any given moment.

Contemplating the use of two energy sources when you haven't even picked one may seem a bit much at this point. No problem. Pick one, design the system around it, and install it. Use it that way for a while. Keep thinking about that alternative, though. Which is the right one may not really become clear until later anyway.

The only important thing you should do before installing a water system is keep your options open. For example, it's always nice to avoid duplicating any more of the equipment than is necessary. Knowing beforehand what additional source might be used will help you select equipment that may also accommodate the other energy source when (or if) it's added. Forethought will at least identify where the systems can be joined. Even if the "mate-up" plumbing is not installed initially, you can keep this area of pipe accessible and otherwise unencumbered for it later. If two energy sources are intended, why not select one that's free, provided you have the equipment to harness it? I can understand a system that has a gasoline-fueled standby generator backing up a utility electricity-powered submersible pump. I can better appreciate a submersible setup with a wind energy backup. A focus here is the word "backup." If the wind machine doesn't supply a major portion of the system's energy needs during the year, at least it didn't cost anything, other than the initial expense of hardware. The same cannot be said for the standby generator. Besides, why rule out the possibility of a pleasant surprise? Wind machines often pay

their own way. If it produces more than 50 percent of the energy needed, you can then say that the utility-supplied energy is the “backup” for your water system.

## WATER PROCESSING

The water source and the site where the water is used are frequently separated by some distance. Even if they aren't, having water at the usage site does not automatically guarantee water flow from faucets, spray from showers, or a full toilet bowl. If we want this capability, then the water must be “processed” into useful form. Processing water involves as many as four functions (Fig. 5 and Sidebar C). The standard utility-powered water system based around the submersible pump performs these functions simultaneously. While this is convenient, it is also wasteful and inappropriate. Each function is distinct. A good water system acknowledges the differences in functions and accommodates their virtues individually. The exploration of these four processes is best revealed by arranging them in a differ-

### SIDEBAR C: THE FOUR FUNCTIONS OF WATER PROCESSING

**W**ater processing involves four functions:

**Extraction** is the vertical movement of water. On an X-Y axis, this is the Y component and it represents lift. Extracting water from a well and pumping water up a hill are examples of extraction.

**Transport** is the horizontal movement of water. On an X-Y axis, this

is the X component and it represents the way pipes will route water from a well to a tank or usage.

**Storage** is the accumulation of water. This may be in a well, a tank, or a pond.

**Pressurization** is the factor that ensures that water will flow out of a faucet with sufficient volume to be useful.

ent order: transport, pressurization, storage, and extraction.

### Water transport

Pipe comes in a variety of sizes (to handle varying flow rates), standard lengths (to keep it manageable), and materials. Pipe made from copper, steel, or plastic is readily available. All types of pipe can be cut to any desired length or, through the use of couplers, extended to any dimension over the length of one standard section. Depending on the type of pipe

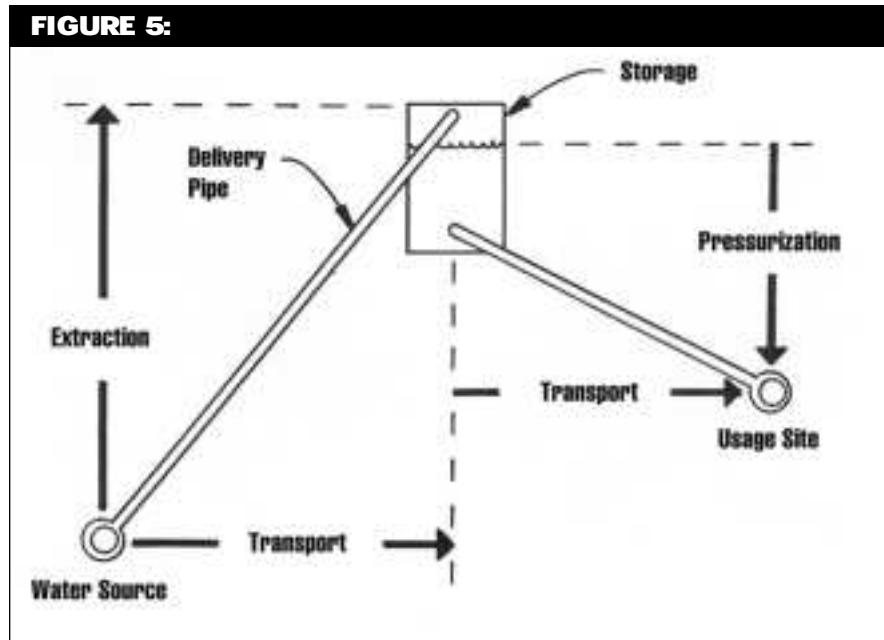
used, the sections are joined by screwing, gluing, or soldering.

Pipe can do everything that a channel or ditch can do and then some. For example, pipe can easily transport water down sharp inclines. Moreover, by attaching the appropriate fitting—a valve—the water flow may be stopped. The real uniqueness of pipe is that its use is essential to the delivery of water to a usage site that is above the water source. Transporting water horizontally does not require much energy. Even in a gravitational system, less than one degree of slope will permit water movement in a channel or pipe without further assistance. In fact, even in a perfectly horizontal pipe or channel, water will flow until it's all at the same level in the pipe. So there's demonstrably not much resistance on the part of water to flow. Once flowing, it wants to continue flowing, too. If any energy is consumed in transporting water horizontally, it is only to overcome the resistance of the channel or pipe itself.

### Water pressurization

Water pressure is essential. If you have it, water gushes out of faucets. If the pressure is weak, the water trickles. Without some pressurization, no water flows. Pressure has some interesting properties and may be measured (Sidebar D).

FIGURE 5:



Processing water may be divided into four functions.

#### SIDE BAR D. PROPERTIES OF PRESSURE AND ITS MEASUREMENT

**1.** Pressure is not related to the length of pipe or to the angle of the pipe. Instead, pressure is directly related to the vertical distance between the level of water and the point of measurement. This is the depth of the water. In water systems, this distance is called the "head." Head is measured in feet.

**2.** Pressure is linear and directly proportional to the depth or head.

**3.** Water is virtually incompressible. That means that while you can pressurize it, this doesn't reduce its volume. Water is very different from air in this respect.

**4.** Pressure is not related to an amount of water—the number of gallons—but, again, only to the depth of water in any combination of vessels and pipes.

**5.** Since pressure is a force and force can be measured, we can measure pressure. First let's establish the units we'd use. A common

one is pounds per square inch, or psi. Metric fans will describe pressure in terms of kilograms per square centimeter or square meter: ksc or ksm. Hereafter, we'll stick with psi.

**6.** A really accurate instrument will measure the water pressure at a depth of one foot at .433 psi. At two feet, that's .866 psi. That also means we'd get 1 psi at a depth of 2.4 feet. A depth of 10 feet would measure 4.33 psi and thirty feet of depth would be roughly 13 psi.

**7.** That water has a pressure of .433 psi per foot of depth can be verified by converting the weight of one cubic foot of water (62.4 pounds) to that weight per square inch at its bottom. Since there are 144 square inches in a square foot, dividing 62.4 pounds of water by 144 square inches yields .433 pounds per square inch.

#### **Static vs dynamic pressure:**

With pressure, we have flow at varying rates. Without it, sprinklers and nozzles won't work. Some washing machines won't operate satisfactorily if there's little or insufficient pressure.

How much pressure are we talking about? Ask a dozen people that question and you're likely to get a dozen different answers. However, they'd range between 25 and 60 psi. Can we narrow it down? Yes the standard is 30-35 psi. The suggestion of this standard is that this amount of pressure provides acceptable pressure in your system. Before you accept that as your standard, I'd like to tell you a story. When I had land in the Sierras, I could only manage to place a tank on a hillside that gave me 30 feet of gravity flow water, or a piddling 13 psi. Still, when I turned on a faucet, the water would blast out. By using larger pipe (1 1/2") in the ground coming down the hill, I had little pipe

loss, and 13 psi seemed like 50 psi in other systems.

In a culture where electricity is cheap and pipe is expensive, small pipes are generally used in water systems. At high flow rates, this results in horrible pressure losses. To compensate, high pressure pumps are used. The trouble starts when people naively install the same size of plumbing in their low pressure system. With such high pressure losses, there's no performance. Only by installing larger pipes can high flow rates and satisfactory pressure be sustained.

**Pressurizing pumps:** Irrespective of the energy source, the hardware that accomplishes both water transport and pressurization in lieu of gravity is the force pump. It's also called a pressure pump, water pump, or lift pump. By whatever name, it exerts a force that will push water along through a pipe.

Transporting water is neither difficult nor energy intensive because it moves water perpendicular to the force of gravity. Only resistance of the pipe itself will fight this effort. However, transporting water is actually a byproduct of the process of pressurizing the water. It takes a very strong force pump to push the water very hard and fast. When the pump's sole function is to pressurize and transport water, I'll refer to it as a pressurizing pump.

A pressurizing pump can be quite small, uses little energy, and doesn't cost very much. One with a working pressure of 30 psi and a pumping capacity of 10 gpm (gallons per minute), enough for most household uses, would cost under \$100 and sometimes half that amount.

#### **Water storage**

As squirrels put away nuts for the winter, one should tuck away some water for a time of greater need. Some water sources, notably ponds and lakes, automatically include the provision of storage. Streams and rivers use the storage of snowpack. Springs and wells have their water stored in the ground.

Artificial water storage buffers the source's inherent capacity against the widely varying flow rates characteristic of any water usage. The actual storage technique used—pond, lake, reservoir, cistern, tank, etc.—is situational. There are many reasons why someone might use water storage (of whatever type). Water storage could gobble up a good chunk of the money allotted for a water system. It's not unusual to find water storage as an integral part of some system that doesn't need it. It may be included for the practical and versatile features it exhibits.

Water storage is useful for normal usage, source variance, energy availability, gravity flow, gravity pressur-

ization, fire fighting, blackouts, and other emergency situations.

**Normal usage:** If the highest rate of usage exceeds the capacity of the source, there's a problem. Without storage, the user must avoid higher than capacity flow rates and all things that need them for proper operation. Or develop another water source with sufficient capacity to handle the highest usage rate. With storage, however, the water source is able to provision the system against high usage rates. Pumping "low and long" from source to storage enables water usage to be "high and short" as needed.

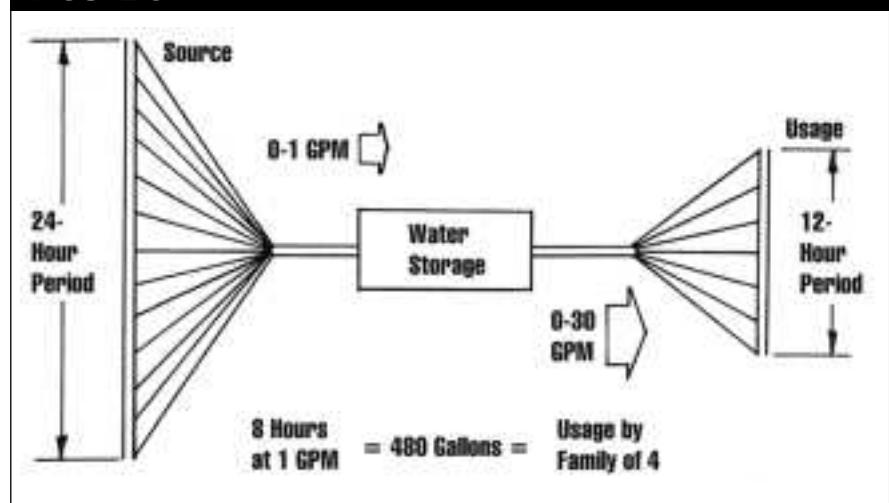
This is a neat trick. Through proper applications of storage techniques, even a water source with an extraordinarily small capacity may be useful (**Fig. 6**). However, this does not increase the source's capacity. In the end, the ledger must balance. The total usage of water in gallons in a 24-hour period cannot exceed the source's capacity to store that much water during the same time period.

**Source variance:** The ability of storage to handle the variances in the capacity of the source, in addition to the fluctuations of usage, depends largely on the water source itself. Some are less susceptible to variance than others.

Most systems need only concern themselves with building a small reserve. But somewhere harks the possibility that the highest use may occur simultaneously with the lowest capacity. Ergo, no water. If this is about to occur, however, it's easy enough simply to exercise some basic conservation to ride out the crisis. In many ways that makes more sense than trying to conceive of every eventuality, designing the system accordingly, and having to foot the bill for all that protection.

**Gravity flow:** Even if the water source is not located at an elevation higher than the usage points it may be possible to site water storage there. If the terrain is cooperative, this may

**FIGURE 6:**



A low capacity source yields a good store of water over time.

involve a hillside location. If it's all flatland or your usage site is located at the highest point, this advantage may be weighed against the cost of slightly elevating, say, a storage tank to achieve gravity flow. This would not necessarily eliminate the need to pressurize the water for some uses. Still, the extra five to ten feet of head (over direct delivery to usage) would not represent any real burden for the pump that must extract and transport the water to storage. Additional uses such as gardening and watering livestock might well be served with this pressurized water, thus eliminating the need for a pump large enough to pressurize all the water.

**Gravity pressurization:** Landowners with a water source high above the usage site will benefit from natural (gravity) pressurization of water. By storing water, everyone can be a winner. No matter how far down the hill or under the ground the water may be, we can always lift it higher than the usage site to a storage site situated to allow gravity pressurization. Where a system has gravity transport and pressurization, the only energy required will be that applied to extraction and, perhaps, some transport. A demand system installed in identical circumstances must extract, transport,

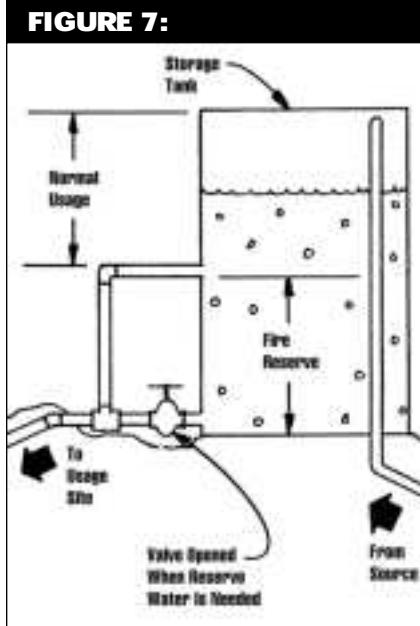
and pressurize water at the highest usage rate. This requires energy use at high rates and large pipe to avoid pressure loss at the higher flow.

The store system, on the other hand, lets the position of the tank handle peak usage needs high flow rates, pressurization, etc. At the same time, it permits low energy extraction of water through (possibly) smaller pipe. Or the utilization of energy sources that are low yield in nature. The additional energy required to boost the water the extra distance to storage (to take advantage of gravity pressurization) should be considered. At such a low rate of flow, it's not likely to be significant.

Beware. The potential for the store system in this situation is exciting but, alas, not always realizable. Don't ignore the relevant factors and impose a system on a situation that is not a good match.

**Fire fighting:** A rural home or farm does not enjoy the same availability of water as the city. It is often supplied by individual wells or springs. Even if fire trucks can respond quickly enough to be effective, there are no convenient hydrants to which they may attach hoses. Accordingly, many fire trucks are designed to carry their own supply of

**FIGURE 7:**



Simple plumbing ensures ample water for emergency needs.

water. Obviously the aid they render is minimal if the fire is not completely doused before they run out of water.

Water storage is fire insurance. Where the system design has sited water storage for both gravity transport and gravity pressurization, hoses and sprinkler systems will still be functional when electric power is lost during a fire. Even a system normally in need of electricity for water transport and pressurization from storage may be saved. Several measures may be taken to accomplish this task when utility power fails. In any instance, the presence of stored water assures the replenishment of a fire truck's dry tanks. Even if the fire fighters can't use your fittings, they usually have the equipment to draw water from your tank through a hose they carry for just that purpose.

It is of little use to anyone with a storage tank if the aforementioned fire occurs at a time when the tank is low or empty. Keeping a tank topped off all the time, however, is neither practical nor always possible. This is particularly true in systems that use a wind

machine for pumping water or pump from low yield water sources. How about designating a certain portion of the tank (one half? one fourth?) as a reserve for fire fighting only? A simple plumbing modification (see Fig. 7) will handle normal usage. In the event of a fire the valve is opened and the water reserve is now available.

**Blackouts:** In the event of a power failure the inability to use the toilet, shower, or kitchen faucet is a nuisance. Since gravity is unaffected by such failures, any water system based on gravity pressurization functions normally in a blackout. Every system using pressurizing pumps for stored water may also be safeguarded from this effect by hooking up a battery to a 12V pressurization pump.

**Other emergencies:** Other events may interrupt the normal operation of a water system. Normal maintenance, i.e., lubrication and replacement of chemicals and filters and component failure can render the system inactive for a time. Cataclysmic events such as freak storms and earthquakes can incapacitate any system. Those equipped with storage, however, can supply their owners with enough time to cope with other pressing matters and set up some alternative pumping if required. As with fires, without implementing an actual reserve capacity in the storage system, there's no guarantee that you'll have a full or partially full tank when an emergency occurs. Don't leave this to luck! Through either automatic functioning or an audible or visual indicator, a reserve capacity should be protected against being drained off in normal, everyday usage.

**Types of storage:** Storage can take many forms. First of all, it may be readily available, as a nearby pond or lake. With the right kind of terrain, ponds or lakes may be made to take advantage of the presence of streams, rivers, or springs. Wherever there's little hope of channeling surface water into these depressions, a man-made

pond may be scraped out of the earth. Another type of storage is the reservoir. It may be earthen or have its sides and bottom lined with concrete. Generally, a reservoir is an uncovered, concrete-lined storage container.

The same factors that limit the use of ponds and lakes as sources of water apply to their use as storage systems. Reservoirs suffer from the same limitations, so I will not consider them any further for primary water storage. Any one of the three may faithfully serve as secondary water storage. It is somewhat annoying in water scarce areas to see a sudden shower yield a small flood. All that water going to waste! With secondary storage, a system may take advantage of a freak rain shower without having to depend upon it. The water captured in this manner may be used wherever needed.

The remaining three storage systems—the well, tank, and cistern—are all good candidates for primary water storage. (**Sidebar E**)

#### **Characteristics of storage:**

Some other good but not so obvious characteristics of storage will manifest themselves at some point. In the interest of saving you some time and money, let's look at open versus closed tanks.

**Closed tanks.** "Closed" tanks are sealed against the atmosphere. They're also referred to as pneumatic, or pressure, tanks. They're small—most don't exceed a 100-gallon volume—and are intended primarily to aid in water pressurization. Though found in any system where the water is pressurized (except gravity), they are most useful in the "demand" water system. Contrary to popular opinion, pressure tanks are not really intended to store water. If so, they would do a bad job; a 100-gallon tank can hold only about 15 gallons of water under pressure. The rest of the space is for compressed air. A pressure tank should never be con-

**SIDEBAR E: PRIMARY WATER STORAGE**

**T**here are three candidates for storing water: in-well, tank, and cistern.

**1. In-well.** Due to the characteristics of wells, once water is struck at some depth, the water level may rise significantly. For example, in my own well in the Sierras, water was struck at 125 feet and immediately rose to within 40 feet of the surface! Attempting to find a larger capacity (the well had tested at 4½ gpm), we drilled the well to 150 feet before we stopped. Since the deep-well cylinder we installed sits at a 125-foot depth, we have 85 feet of "storage" in the well (125 feet minus 40 feet). For a hole 6 inches in diameter, that's approximately 1.5 gallons of water per foot. For 85 feet, this represents 128 gallons of storage water.

In a way, this was free. We had to drill to 125 feet in order to hit water in the first place. However, had we hit water at 40 feet, we probably would not have drilled more than 25 feet farther. Why? At \$10 per foot of drilled well, the in-well storage capacity is costing over 6 dollars per gallon! We had already decided to site the storage tank for both gravity flow and gravity pressurization. Therefore, the "siting" of the in-well storage was not a matter of preference and is, in fact, in the wrong place!

In-well storage has its place. In a "demand" water system, in-well storage serves as a buffer against

higher-than-capacity usage while assuring that the inlet to the pump is, at all times, submerged. Low-capacity wells may need to be drilled extra deep to prevent drawdown—the distance the water level drops during normal pumping—from exposing the pump inlet. However, at the lower pumping rates characteristic of stored water systems, drawdown is seldom a problem.

**2. Tank storage.** Water may be stored in tanks made of wood, metal, concrete, or plastic. Plastic and some types of metal tanks can be delivered to the property ready for use. Of course, this is more expensive than building tanks or cisterns on the site. This relatively higher cost of storage may be justified in light of the convenience and the built-in protection against contamination (relative to the cistern).

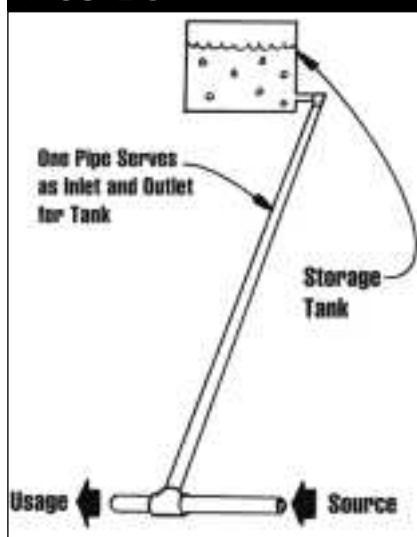
**3. Cistern storage.** A cistern is normally classified as underground water storage. Since tanks, reservoirs, and cisterns overlap somewhat in definition, we will define a cistern to be a non-portable concrete tank that is built on-site, is buried or partially buried (using the earth to help support its walls and bottom), and is completely covered (which distinguishes it from a reservoir). By this definition, little or no sunlight reaches the water in a cistern. With proper screening the water is not accessible to anything larger than a gnat except through an access hatch.

fused with a tank designed to store water.

**Open tanks.** Tanks that serve only to store water are usually "open" to the atmosphere. This category includes cisterns or steel tanks because, in fact, they're only covered, not sealed against atmospheric pressure. A tank that stores water should

always be equipped with a vent pipe, which permits free movement of air into and out of the tank as the water level falls and rises.

Tanks that are completely buried in the ground are most susceptible to airflow blockage, but it's an easy situation to remedy—a vent pipe may be attached at either the input or the out-

**FIGURE 8:**

A tank may share the same pipe for inlet and outlet.

put pipe. Luckily, this can double as an overflow pipe. Since some systems may normally route tank overflow to some other use, i.e., gardens, orchards, pools, and other tanks, it may be wise to isolate the two functions so that there's no risk of blockage.

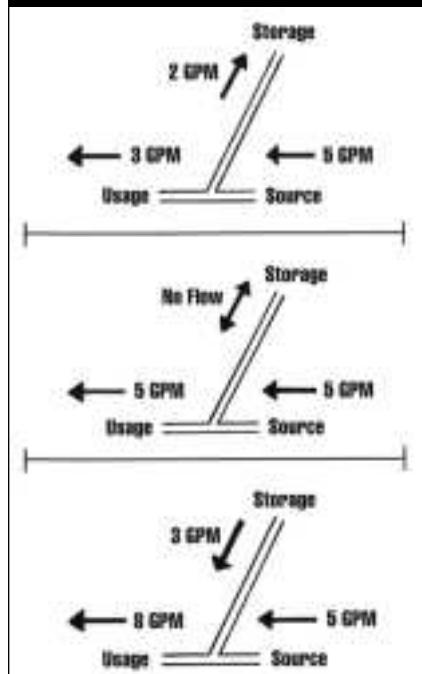
**Tank plumbing.** Typically, a tank (hereafter also meant to include cisterns and reservoirs) has the inlet pipe at the top and the outlet pipe at the bottom. This follows from the days when wind-powered water pumping extracted the water from wells and transferred it directly to storage. However, insofar as pressure is related to the depth and not the quantity of water, it will make no difference to the pumping (and extraction) equipment if the water inlet to the tank is located at the bottom instead of the top. Either way, the water gets to the storage tank. It's actually easier to pump water into the bottom of the tank. At low tank levels there's a few feet less head for the lift pump to push against. As the tank approaches its maximum level, this difference is negligible.

One distinct advantage of locating the inlet pipe at the base of the tank may be for the inlet and outlet to share

the same pipe. This is very situational but it avoids duplication and cuts pipe costs in half. Where there is a potential for gravity flow (pressurization), this little trick cuts in half the length of pipe needed to do the job (**Fig. 8**). The idea of combining the inlet and outlet causes some confusion about operation. What happens when water is being used at the same time water is being extracted and transferred to storage? How can the water flow up and down the common pipe at the same time?

The answer is simple. It doesn't. When the supply rate from the source is greater than the usage rate, all of the usage water comes directly from the supply (**Fig. 9**). The remainder of the supply water is pumped to storage. When the supply rate is lower than the usage rate, all of the supply water goes toward usage and the remainder comes from storage. As confusing as it may seem, the water knows what to do. Variation in supply or usage

**FIGURE 9:**



Water always knows which way to go in a variable flow.

#### SIDEBAR F: THREE TECHNIQUES OF EXTRACTING WATER

**T**here are three techniques of extracting water: hauling, induction, and pushing.

**1. Hauling.** Hauling implies capturing, lifting, and dumping the water for immediate or eventual use. This includes techniques such as buckets pulled up by ropes, the use of a mechanical lever (the hand-cranked winch over an open well), or a mechanical conveyance system. For anything other than very small water needs or small distances, this method tends to be labor-intensive. It may be practical if a renewable source of energy, such as water or wind power, is available.

**2. Induction.** Water may be extracted by induction, or suction, which utilizes the natural forces of both gravity and atmospheric pressure in producing a vacuum (**Fig. 12**). If you evacuate the air from a pipe with its lower end submerged in water, atmospheric pressure will push the water up the pipe. This is similar to sucking soda through a straw. The better the vacuum, the higher the water will rise.

Extracting water by suction is limited to the amount of force exerted by atmospheric pressure. At sea level this amounts to a limit of 32 (vertical) feet for a perfect vacuum. Since we can't generate a perfect vacuum, the practical limits of suction are about 25 feet. With each thousand feet above sea level, this

value decreases by another foot. At 7,000 feet, then, the practical value of suction is about 18 feet (25 feet minus 7 feet).

Elevating water by suction is limited to the type of pump that is able to generate a vacuum or is able to hold its "prime." The smallest air leak in the pipe will nullify the lifting of water by suction.

One offshoot of extraction by induction is the siphon. Most of us, at one time or another, have had to use a siphon hose (otherwise known as an Oklahoma credit card) to extract gasoline from a car's tank. Those who have tried this and failed are usually in violation of one very important rule of the siphon: once started, the outlet of the hose (or pipe) must be lower than the level of fluid at the source. Also, if the fluid level drops below the pipe's inlet, air will enter the system and stop the siphoning effect. To avoid constant priming, a faucet may be added. This will limit the extraction flow rate to something less than the source's own capacity.

**3. Pushing.** Most water systems use the "push" technique for extracting water. Here, pumps collect the water and force it upward. If the pump's outlet is open to the air, you get a fountain. Confine the forced water to the inside of a pipe, and the water will rise upward to some higher point in the pipe.

rates produces no detectable or undesirable effects.

There is one potential problem in using the common pipe idea: the lift pump in the system may "leak." This would allow backflow out of the storage tank when not in operation. Theoretically, it doesn't but experience says otherwise. Pumps wear and their seals may leak. If the pipe that

connects the source to storage enters the tank at the top, the only water "lost" back into the well is that which is in the delivery pipe. Where the inlet pipe is situated at the bottom of the tank, the loss could be all of the water in the tank. There is a simple solution to this problem—a check valve. Use a gravity type (not a spring type) check valve. In placing it at the outlet from

the well, you ensure that no water will be lost back into the well from pipe or tank. At fifteen to twenty dollars in cost, the check valve is cheap insurance against backflow.

**Tank Cleanout.** The tank outlet is rarely located in the very bottom of the tank. Indeed, it is about 6 to 12 inches up the side. Why? Operate the system for a while, then drain the tank and you'll have the answer! The polite name for all of that gunk and muck coating the bottom of the tank is sediment. How did it get there? An open tank or a poorly covered one will always allow dirt, leaves, insects, lizards, and mice into the water system. Also, the incoming water may carry its own sediment, held in suspension. In the tranquil waters of the tank, this will precipitate out. Some minerals in the water itself will, upon contact with air, precipitate out in a storage tank. Locating the outlet up the side of the tank a wee bit, then, will always result in this accumulated debris.

Whatever the source, provide some means of ridding yourself of this accumulated debris. The simplest setup is to install a cleanout plug in the lowest part of the tank. Then, when it's time, you drain the tank. Better yet, let it drain through normal usage after shutting down the refilling system. Then, remove the plug. If the tank bottom isn't designed to drain like a bathtub or isn't tilted to ensure removal of all refuse littering the bottom, remove the plug while the water level in the tank is still high. This will flush out the debris.

While this technique works, I prefer an additional feature in a storage tank access. With reservoirs and open top tanks this is already provided. Covered or buried tanks should include an access hatch. If you can squeeze your body into the tank, you can be absolutely certain the bottom is clean. A bonus is a visual confirmation that the sediment level is getting a bit thick. There are other advantages

#### SIDEBAR G: PUMPING CAPACITY

In a water system the precise capacity of any pump may be established by asking three questions.

1. How much water must we lift?
2. How high do we want to lift it?
3. How fast do we want to lift it?

The relationship between these three factors—how much, how high, and how fast—may be equated to another standard: horsepower. One horsepower equals 33,000 foot-pounds per minute. If 33,000 pounds is lifted one foot in one minute's time, one horsepower has been demonstrated. If one pound is lifted 33,000 feet in one minute's time, that's also 1 horsepower. If 330 pounds is lifted 100 feet in one minute, that's still 1 horsepower's worth of work. In working with water, we're used to dealing with gallons, so let's convert the formula.

One gallon weighs 8.33 pounds. 33,000 foot-pounds per minute divided by 8.33 pounds will lift 3,962 gallons of water a vertical distance of 1 foot.

in having some access wall scrubbing, checking on water turbidity, water level detection, help in removing accumulated debris, and repainting of the interior walls. Access demands control. A hatch with a child proof locking mechanism is the minimal requirement.

**Overflow.** Any type of pump used to store water in an open tank is said to be pumping into an "open head." Therefore if the water leaving storage does not keep up with the water coming in, the storage tank may overflow. This is not such a serious event, but it can be messy. Can it be avoided? Yes—prevention is one possibility. It requires, among other things, some means of detecting the presence of overflow. Better yet,

If we do it in one minute's time, it only consumes 1 horsepower. If we round off this figure to an even 4,000 gallons of water per minute per foot and change nothing else, then 1 horsepower will lift:

**400 gpm through a head of 10 feet.**

**40 gpm through a head of 100 feet.**

**4 gpm through a head of 1,000 feet.**

For flow rates in the 4 gpm range, it won't take much horsepower to lift water some pretty hefty distances.

Beware! These figures represent water horsepower only. No allowance has been made for any losses. These figures assume frictionless pipe, a 100 percent pump efficiency, and a perfect conversion of the energy (from whatever source) into the mechanical motion required by the pump mechanism.

In most instances, we must multiply the calculated water horsepower by at least a factor of two or three to compensate for pump efficiency, gas engine inefficiency, and pipe losses.

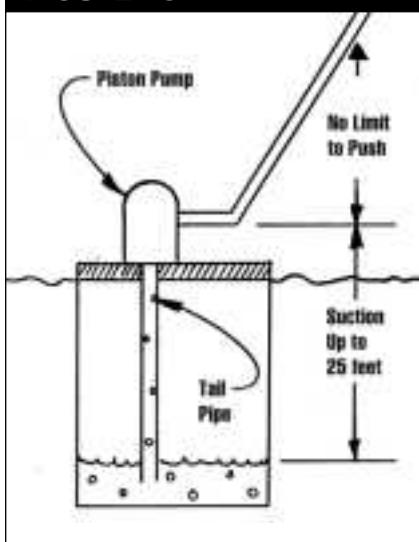
put unintentional overflow to some practical use.

**Sizing storage:** The amount of normal usage, source capacity variance, energy availability, emergency needs, favorable terrain all affect the sizing of water storage. How much is needed? You're one step closer to the answer once you've sketched the preliminary design and selected primary and secondary water and energy sources.

#### Water extraction

While it's handy to have the water source on the same level as or above the usage point, many people are not so fortunate. When the water is at the

**FIGURE 10:**



Suction allows water to be drawn up into a pump.

bottom of a hill or at the bottom of a well, the water must be extracted.

There are basically three ways to extract water: hauling, induction, or pushing (**Sidebar F**).

Some types of force pumps combine several of these extraction techniques in normal operation. For example, the shallow well pump is mounted as high as 25 feet above a water source. In operation, it sucks water up through its inlet pipe and then pushes it to a much higher elevation (**Fig. 10**). Another force pump, the deep well piston pump, is technically able to use

all three extraction techniques—suction, lift, and push—in one cycle of its operation. Other types of pumps (jet and centrifugal) use only one extraction technique under the best of conditions.

**The lift pump:** As previously defined, extracting water is distinguished from both transporting and pressurizing water in that it involves only the vertical component of water processing—moving water straight up. A pump that will force water upward may be called a lift pump to help distinguish it from a pressurizing pump. That's important, because for all practical purposes you couldn't tell them apart—they're both force pumps. In real life, a pressurizing pump will lift water and a lift pump will pressurize water. However, a pressurizing pump's principal job is to pressurize water for use. Transporting it is simply a byproduct. On the other hand, a lift pump's purpose is to extract water. This may be to get it out of the well (a purely upward motion) or up a hill. It will probably include some horizontal transport as well (**Fig. 11**).

There are pumps that do all three things—extract and transport and pressurize. As we shall soon see, the requirements of these pumps are quite different from those of pumps that work simply to extract water.

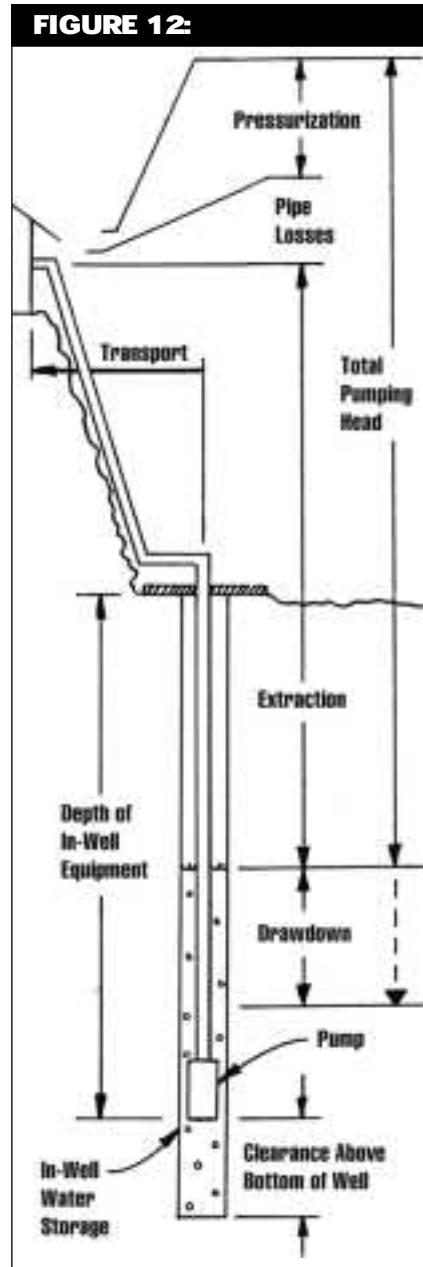
A pressurizing pump fights only pipe resistance. A lift pump must fight pipe resistance and gravity. A lift pump, therefore, must pump harder and faster to overcome the opposition. But how much pressure do we need to fight gravity?

One of the two major ratings of any lift pump is how much pressure it will develop. For each foot of height that we want to raise water, we will need a pump pressure of .433 psi. A 10-foot raise requires 4.33 psi. A 100-foot raise requires 43.3 psi.

Pumps don't just "make" pressure. A pump produces pressure at some particular rate of flow. Use it in differ-

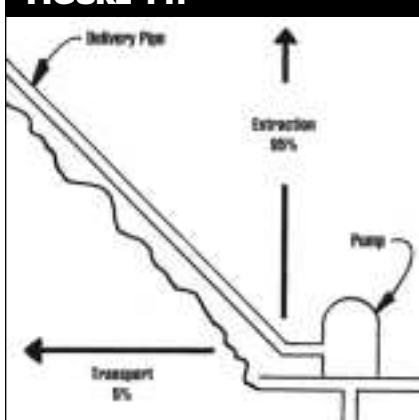
ent situations and within limits, it will supply different rates of flow. In a way, we can say that it trades off pressure for flow rates. The higher the pressure (the head) into which it must pump, the less the flow. So, in addition to the pressure needed to combat gravity and losses, all pumps must add service pressurization (**Fig. 12**).

**FIGURE 12:**



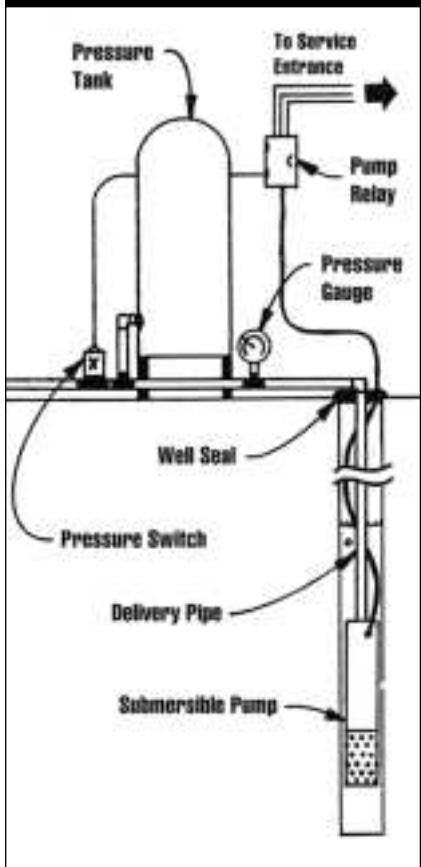
The dynamics of water processing.

**FIGURE 11:**



Transport of water uses less energy than extraction.

**FIGURE 13:**



Standard components of the demand-type system.

**Water horsepower:** A really good way to get a feel for the dynamic state of water extraction is to look at the energy requirements. Lifting water is akin to lifting weights. Depending on your muscular build, you could lift a small weight from the floor to a point over your head in a certain period of time. Lifting a larger weight through the same distance would probably take you longer. The range of weights is unimportant. The essence here is that each of us has a built-in capacity for work. The same goes for pumps. They have design limits. It doesn't matter what type of energy source is connected, they can still only handle a specific work capacity. And as in human weight lifting, we're working with three

things: weight, distance, and time (**Sidebar G**).

**Water extraction and energy:** It takes energy to extract water. Let's review the issues:

1. For any flow rate, we need a certain amount of energy to push the water against both gravity and pipe resistance. Double that flow rate and the energy required is double the original value plus the additional energy required to combat the fourfold increase in pipe resistance.

2. If higher flow rates result in higher energy requirements and increased pipe resistance, that also means that lower flow rates will need less energy and suffer lessened pressure losses.

3. It is true that if we pump water at a smaller flow rate, we must also pump longer to get the same total amount of water to the same elevation.

Extracting water quickly prohibits the use of some energy sources which simply cannot produce energy at a high rate. Systems capable of producing energy in smaller amounts can get all of the water to the desired elevation but will simply require more time. The effect of pipe resistance is almost eradicated at lesser flow rates, so slow pumping has a greater overall efficiency for the water pumped. Only with a well installation is the lift pump pushing water straight up. If, instead, it pushes the water through a pipe up a hillside at some angle of slope, a horizontal component or transport is also involved.

**Final comments:** Even though I have separated the functions of water processing into extraction, transport, storage, and pressurization, the two basic types of water system—demand and store—frequently combine these functions in operation.

The demand system is inactive except when water is required. Then, when the system turns on, one pump does everything—extraction, transport, and pressurization (**Fig. 13**). While it may be convenient, it is inefficient since the pump requires a rate

of energy usage that represents the largest rate of water flow (in gpm) needed in the system. Even at very small flow rates, then, the pump uses energy at a rate that may be 5-10 times the amount required to handle the specific need.

The store system separates the functions that are necessary at the water source from those required at the usage site (**Fig. 12**). In this setup, extraction and transport of water from the source may be tailored to source capacity without ignoring the widely varying needs—pressure and flow rates—of the usage point. The buffer that performs this minor miracle is storage. If storage can be sited high enough above the usage site to make gravity pressurization possible, the extraction head is only slightly increased. If storage is too low for gravity pressurization, a small pressurizing pump may be added. Either way, the overall energy needs and efficiency of a store system is a fraction of that required for a demand system.

**Preview:** In the next issue of *Backwoods Home Magazine*, we will look more closely at the variety of tanks that may be used in a water system, the ratings and installation of pumps, water system accessories, and examples of both the demand type and store type water systems.

(Michael Hackleman is the author of seven books on do-it-yourself renewable energy topics. For a current publications list, send an SASE to P.O. Box 327, Willits, CA 95490.)  $\Delta$

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# FULLY INVOLVED

**By Diana Morgan**

A strident tone blasts me from sleep. I catch the words "fully involved" first time around. Where the heck are my glasses? Oh, God, I can't find my glasses. Panic. Fumble the light on, knocking my specs to the floor. I'm getting too old for this middle-of-the-night stuff. The dispatcher's monotone repeats itself and this time I get the details of what and where. I yank on yesterday's clothes, always left by the side of the bed.

I hate structure fires. Hot dirty things that gobble up someone's memories and dreams. Sometimes the people themselves. The really bad times.

A hurried stop in the bathroom—last chance I'll get for five or six hours—and I pound down the stairs, finger combing my hair. The rest of the house sleeps on and only the dog raises one bleary eyelid at me as I tromp through the kitchen throwing on lights and grabbing keys.

The car fails to start on the first crank. Calm down, you're racing like a rookie. I sit back in the seat, force the adrenaline rush down, and try again. This time the engine catches. I reach out and jab the plug for the red light into the empty cigarette lighter socket, snap the seat belt, and slam into reverse.

A mile from the scene the smoke becomes visible. There's horrible beauty in a house afire. On clear cold nights the smoke rises straight up in a broad multi-hued column. Pink, gold, even green swirls

through the black and gray. A palette devised by a schizophrenic artist intent upon painting his worst nightmares. Something Stephen King would dream up.

Damn! Damn! Hell! Definitely hell. I realize I'm slamming my fist against the steering wheel and stop. This one's a real cooker. Flames, visible even above the trees, lick at the smoke, chasing it higher. No water flowing yet either. Not if I can see flames from here.

You can tell if the others who got there before you have started knocking down a fire because the color washes out of smoke as water turns to steam.

Thick oily black smoke roiling up is always a bad sign. Means something nasty is burning. Burning fast and hot. Hydrocarbons. Hazardous materials. Something other than good clean wood. Not much wood in houses any more. Synthetic materials that give off toxic gases when they burn. Gases that kill firefighters.

I experience the heat, so intense it stabs through the closed car as I drive past looking for a place to park. Can't see a thing. Fire's too bright and the darkness too dark. Afraid I'll pull into a ditch and become another casualty the others have to deal with.

I haul off my shoes and coat, struggling into bulky gear and rubber boots designed more for protection than movement. A final grab at helmet and gloves and I clump off in search of my captain and instructions.

The fire ground is like a scene from Faust. Shadows dancing in the reflected flames are brought to stark life by the sudden flare of halogen lamps abruptly lit. Figures scamper to-and-fro between trucks and burning building. Uncharged hoses snake everywhere in the tumult. The noise is painful. Officers shout orders to the troops amid the crack-

le of portable radios and ravening flames. Engines grind to a deafening roar as the pumps engage. To an observer it would appear as chaos gone mad; but there's an order here, known only to the participants.

Not much of a crew here yet so the captain puts me on a hoseline with another veteran of these sad wars. There won't be any interior attack on this one. We can't get near the inferno to get inside. Hose clamped to my hip, I struggle to keep standing as dirty black water runs over the ice underfoot. Back and forth, back and forth we aim the stream of water, a hundred pounds of pressure's worth, at the gorging enemy. He runs his greedy fingers up walls and licks a slavering tongue through the holes he's chewed. A window explodes from heat and pressure and we duck the flying shards.

A fire uses up oxygen at an alarming rate, replacing itself with toxic gases and smoke. These gases become superheated increasing the pressure inside the building. Eventually this pressure will blow out windows or doors and the renewed burst of oxygen will ignite the fire with explosive results. A house in backdraft readiness will puff smoke in and out through any available cracks around windows and doors, a sure clue to trained firefighters that death awaits the unwary.

A house on fire roars like a demented hurricane, a howling rumble interspersed with the cackle of sparks and the hiss of steam. At first the heat, a thousand degrees and more, drives us back, but we slowly knock the enemy down, our puny stream spitting in the face of the blaze.

The hose abruptly goes limp and the fire jumps up in glee to gobble a door and waggle his tongue at us. We shout and gesture though,

knowing our comrades back at the pumper are scrambling to get the water flowing again. We've been there at fires past, aware of the unavoidable glitches. We bitch anyway, venting our frustration while the fire regains his lost ground.

The hose surges to life, nearly knocking me down, and we resume the monotonous back and forth stream of watery bullets. We tango forward and back with the fire for what seems like hours and probably is. First he advances, and then we bend him backward over the bulk of the devastated house. Eventually, the captain raps me on the helmet to get my attention and hand signals to shut down our hose.

Hot and sweaty, our faces grayed with soot, we trudge towards the ladies' auxiliary for sandwiches and a drink. Coffee? Water? Gatorade or soda? I gratefully accept a diet soda and pull open my coat. Steam rushes off my chest, my own perspiration turned to vapor by the heat.

The auxiliary ladies look at me and shake their heads. They'll never understand why I want to be on my side and not theirs. All they see is a woman, no longer young, who opts for the grinding dirty drudgery of firefighting. They'd rather minister to the fighters than the fire and can't comprehend that I do it because I'm terrified of fire. I need to do battle with it. A few have asked me and my answer confuses them.

I rub my arm across my face, smearing the grime. I know I look a mess, hair never properly combed now flattened by my helmet. I'm too tired to care. I sink down onto the cold back step of the rescue truck, knowing the job is only half done.

Exhausted firefighters don breathing apparatus and venture into the ruined house. On a search and destroy mission, they tear down any remaining inside walls where the

enemy may still be hiding and waiting for his chance to continue the rampage. Too old to be allowed to do inside work, I switch from firefighter to EMT.

I help refill air bottles as my fellows stagger from the building, dirtier still, alarm bells ringing a few minute's worth of air left in their tanks. I check them for heat exhaustion and smoke inhalation. They test positive when the whites of blood-shot eyes go gray and flushed skin feels dry. If they pass I load them up with a fresh bottle and send them back.

Most firefighters have to be restrained from returning to a burning building too many times. The mix of adrenaline, oxygen deprivation, and exhaustion blurs common sense and breeds madness. The EMT staff is there to make sure this idiocy doesn't result in tragedy. One reason most senior officers don't fight fires is that someone needs to keep a clear head.

A shrill shout. Firefighter down. A beam has fallen on someone. They've got to get him out before his air supply is gone. I stand by the rescue truck, twitching nervously, going over in my mind what I'll need off the truck. I grab a shell-shocked compatriot and pile him up with splints and a backboard. Given a purpose he pulls out of the hole he retreated into and follows me toward the building.

I meet another EMT as he emerges from the wreckage. Wordlessly he grabs the backboard and charges back inside. Soon they all come out with our fallen comrade. He moans and tosses on the hard narrow board, trying to tear his facemask off. I reach down and gently remove it for him. His air pack has already been taken off and, still attached to the mask, is carried beside him.

I try to calm the man I've known and worked beside for years while I run my hands all over him feeling

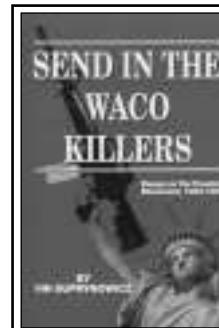
for broken bones and deformities. He winces a couple of times, complains of back pain and sore knees, and begins to breathe more normally. The heavy timber hit his air pack, knocking him to the floor and pinning him there. He's lucky,

The ambulance picks its way through the covey of fire trucks and I reluctantly turn my friend over to the paramedics outlining his possible injuries. They immediately start an IV and check him all over once more. I find their arrogance vaguely insulting, and watch helplessly as they speed off with the firefighter on board.

Fire finally out, weary and running on fumes, we pack up hose and air bottles and shut down the lights. Back at the station we've got three or four more hours of toil ahead of us. Filthy hoses have to be washed down and hung to dry. Clean hose must be loaded onto empty trucks in case, God forbid, we should have another fire somewhere soon. The self-contained breathing apparatus has to be put back in service, filling air bottles yet again and disinfecting masks.

We drag along on leaden feet until the chores are at last finished and we can drive home to shower and fall in bed. Or head out again to work, stale and stupid, unready for whatever the day demands.

The reasons why brave and foolish souls voluntarily rush into burning buildings are obscure. To prove we're still alive? The addictive adrenaline rush? A gigantic desire to do good in the community? A monumental hubris that shouts "invincible?" If you asked us "why?" most couldn't give you an answer. Nothing that makes sense to anyone, including ourselves. The explanation's too complex, too personal, too visceral for those who haven't done it to understand, and the rest of us don't need to. Δ



## SEND IN THE WACO KILLERS

Three times the International Society of Newspaper Editors has included Vin Suprynowicz in their list of the 12 top weekly editorial writers in North America. For years his shoot-from-the-hip style has opened the eyes of thousands to government abuse of our liberties. In this book, Send in the Waco Killers, he blends material taken from his syndicated column with new commentary to give the reader a detailed, reporter's-eye-view of how the rights and freedoms of Americans are being subverted.

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Had he lived 225 years ago he'd have written a book to detail how King George III and Parliament have tried to enslave us but, sadly, this book is about how our government today is depriving us of our freedoms and ruining the lives of thousands without changing even one word of our Constitution.

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# SOLAR DRYING

**By Marcella Shaffer**

The oldest known method of food preservation is drying food using the heat from the sun. Unfortunately it has become the least used as freezers and pressure canners have taken its place. While these methods of food preservation are certainly effective, they have drawbacks when compared to solar food drying.

Freezing is quick and easy but requires purchasing an expensive freezer if you don't already own one. It also requires electricity (or other form of energy) to operate. Unless you are "off-the-grid," a power outage can result in food loss.

Canning food requires more work than freezing but is generally unaffected by power outages. The initial expense of getting started can be substantial if you have to purchase the

canner itself and related items like jars, lids, etc., and new lids must be purchased each year. Also, a source of energy is required, (electric, wood, gas, propane, etc.) while preserving, and canned food requires a lot of storage space.

Preserving food by solar drying requires no energy except the heat of the sun. Dried food also requires no energy to maintain it while stored. Related expenses are practically nothing, and little storage space is required. Drying food is easy to do and doesn't require any special skills or equipment.

Dried food is excellent for hiking and camping because of its light weight and compact size. Several days rations can easily be placed in a backpack or your pockets. Best of all, dried food is delicious and nutritious.

## **Solar drying basics**

Dried food is preserved by its moisture content, or rather the lack of it. It is always better to have food overly dry than not dry enough. Mold, due to inadequate drying, is the main cause of food spoilage while stored.

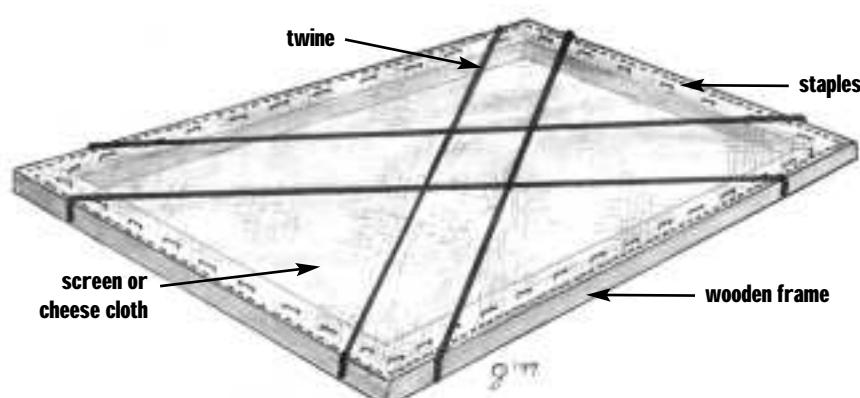
Climate can affect solar drying. The ideal climate is one with low humidity and bright, strong sunshine. If you live in a humid or rainy area you may wish to dry foods with a dehydrator or in the oven. While drying in this manner will require some form of energy, the other benefits of dried food will still be available to you.

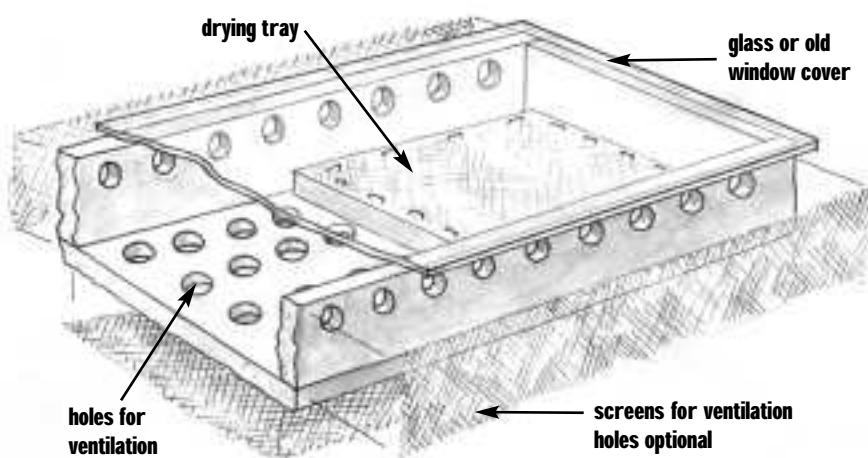
Do not dry your food outside in an area with a lot of traffic or air pollution. Contamination is possible from airborne emissions.

After food is prepared for drying, spread it in a single layer (pieces not touching) on drying trays and place in a sunny spot which permits good air circulation. Turn food daily. Dry strong-flavored or odored foods by themselves.

Drying trays can be made by simply using a frame and covering it with cheesecloth or plastic screen. Stretch tightly and fasten on the back with staples or tacks. A string can be placed across the back for reinforcement to prevent sagging (See illustration).

Do not use metal screen unless you cover it with cheese cloth. It may con-





taminate or ruin your food. Window frames, window screens, door frames, or discarded screen doors all make good drying trays. Set the tray on rocks or pieces of wood to permit air circulation from all sides. If insects are a problem while drying, loosely drape cheesecloth or other such fabric over the drying food. Arrange it so it does not touch food or it may stick.

To intensify the heat from the sun, an old window or piece of glass, can be placed above the food on the drying rack, allowing several inches of space for air circulation.

A simple solar dryer can be built from scrap material and an old win-

dow. Build a box similar to a gardening cold frame and cover with a piece of glass or plastic. Ventilation holes can be covered with screen to control insects if you wish. If the temperature inside gets too high (over 135-140 degrees F) provide more ventilation by raising the glass top a few inches.

Selecting a warm spot, like a heat reflecting driveway or roof-top, can help also.

Bring your trays inside at night or if rain threatens. Finish drying in the oven or over your heating stove if necessary.

Variables like your particular locality and climate, humidity, heat, and the food itself can affect the length of time it takes for food to dry, so it is impossible to give specifics. The following guidelines offer some dryness indications for particular foods.

Harvest your fruits and vegetables when they are at the peak of flavor. It is better if they are slightly immature than overly ripe.

Never place dried food which is still warm directly into the storage containers. Always let it cool completely first.

### Fruits

Wash and dry fruit. Peel if desired and slice thinly. Apples, peaches, and other fruits may darken when exposed to air. This is caused by oxidation which can damage flavor and vitamin

content. To prevent oxidation you can dip the fruit slices in a preserving solution. One solution is a salt water dip which is made by adding six tablespoons of pickling salt to one gallon of water. Soak for two to three minutes, then drain. Pat dry. Another solution is two tablespoons of ascorbic acid powder to one quart of lukewarm water. Soak, drain, and dry as above. Commercial fruit preservatives can also be purchased for this purpose.

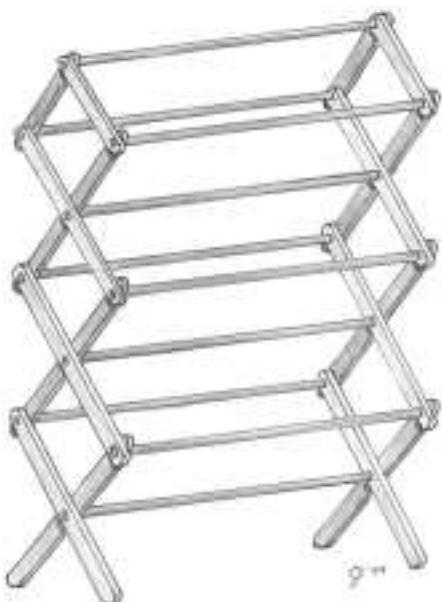
Fruits are dry when somewhere between leathery and brittle. Drying times are affected by a number of factors, so experience and common sense are the best guides. After sun drying fruit it needs to be "equalized." Remove from trays and place in a bowl inside the house. Several times per day, for one week, stir the fruit pieces. This will allow any moisture from pieces that are not totally dry to be transferred to those which are overly dry.

Another way to equalize dried fruit is to place it in a paper bag after removing from drying trays. Fold over the top of the bag and hang from the clothesline. Shake gently several times a day for two days.

### Fruit leathers

Overripe fruit can be used to make fruit leathers and is actually better than fruit which is at its peak. To prepare fruit for leathers, rinse then turn into puree by grinding, putting through a food mill, or mashing with a potato masher. Remove peels, pits, and seeds. Add fruit juice if necessary until it is of a consistency that will pour. If the fruit is too runny, thicken by cooking over low heat to evaporate water or add a thickener, such as wheat or oat bran.

Sweetening or spices can be added if you choose. Begin by adding only one to two spoons of sweetener since many totally ripe fruits need nothing more. If you are making leathers from light colored fruits such as apples or peaches, heat to almost boiling before



beginning to dry. This will help prevent browning.

Fruits can also be combined. Some good combinations are cherries and rhubarb and strawberries and rhubarb. All of the small berries like raspberries, blackberries, and mulberries go well together.

Line a cookie sheet or tray with plastic (don't use wax paper or foil) or coat with a non-stick vegetable spray or cooking oil. Pour the puree in and spread evenly by tilting the tray or sheet back and forth to spread it out. The thinner and more consistent the thickness, the better and quicker it will dry. One-eighth of an inch thick works well. If it is too thick it may spoil before drying, and if not consistent it will not dry evenly.

When top side is dry, remove from backing and turn over. Let the other side dry. Cut into squares or strips and roll up. Leather which is slightly sticky to touch will keep for about four to six weeks. Leather which is completely dried will keep longer but may be too brittle to roll.

Store leather in airtight containers with plastic wrap or paper between them to prevent sticking. Leather can be used as snacks or dissolved in water and used in any recipe calling for fruit.

| <b>GUIDELINES FOR FRUITS AND VEGETABLES</b> |  |  |
|---|--|--|
| <b>Food</b>                                 | <b>Preparation</b>                                 | <b>Dryness test</b>                            |
| Apples, pears, peaches                      | Wash, core, and peel. Cut into ¼" slices or rings. | Leathery with no moisture when cut             |
| Apricots, plums                             | Wash, halve and pit. "Pop" backs.                  | Leathery and pliable with no moisture when cut |
| Bananas, rhubarb                            | Peel, slice in thin rounds.                        | Brittle  |
| Berries                                     | Sort, wash, and remove stems.                      | Brittle and hard                               |
| Cherries, grapes                            | Sort and wash. Pit cherries.                       | Slightly sticky, like raisins                  |
| Asparagus tips                              | Wash, blanch 3 minutes.                            | Leathery to brittle                            |
| Beans, cabbage, peppers                     | Wash, chop into small pieces. Blanch 4 minutes.    | Brittle  |
| Broccoli, cauliflower                       | Wash, trim, and chop. Blanch 3 minutes.            | Brittle  |
| Carrots                                     | Wash, cut into slices. Blanch 3 minutes.           | Dry and brittle                                |
| Corn  | Husk, trim, cut off cob.                           | Dry and brittle                                |
| Mushrooms                                   | Wash, sort, and slice ¼" thick.                    | Dry and brittle                                |
| Onions                                      | Remove outer skin, then chop.                      | Brittle  |
| Peas  | Shell and sort. Blanch 3 min.                      | Brittle  |
| Squash, zucchini                            | Wash, peel, remove seeds. Blanch 2 minutes.        | Leathery and tough                             |
| Tomatoes                                    | Scald, chill, and peel. Slice into quarters.       | Leathery and tough                             |

## Vegetables

Vegetables, like fruits, should be harvested at their peak of flavor. Wash to remove dirt, then prepare for drying by peeling, slicing, etc., as desired.

Controversy abounds over blanching vegetables before drying. Some insist on it, while others feel it is not necessary and successfully preserve without it. To blanch vegetables, steam them over boiling water until they are heated throughout and look translucent when cut with a knife. Remove from steamer and cool immediately with cold running water or plunging into a pan of ice water. Drain, then pat dry with cloth or towel.

Spread on drying trays, as with fruits, and dry in the sun. Most vegetables are dry when they are brittle and will shatter when struck. Slices will snap when bent.

## Storing dried food

Often fruit, even when dry, will stick together when stored. A tasty way to help prevent this is by "dusting" before storing. Powdered sugar, spices, or powdered oats can be used as "dust." Place it in a bag then add fruit and shake to coat the pieces. Dusting fruit leather or placing pieces of paper between the rolls will prevent them from sticking.

Almost anything can be used as a storage container, as long as it has a tight fitting lid. Recycled jars or other containers work well, as well as storage bags or canning jars. If using a metal lid, place a piece of paper between the food and lid. Light causes oxidation, so store the dried food in a dark place or put the containers inside paper bags or a cardboard box to block light. Keep in a cool place.

Storing in small batches is wise. In the event one piece is not dry, it will not ruin the entire batch. Check weekly for signs of mold for the first several weeks. Label the food before storing.

### Simple and tasty jerky

3 lb. meat  
 2/3 tsp. garlic powder  
 2/3 tsp. pepper  
 2 tsp. onion powder  
 1/2 c. soy sauce  
 3/4 c. Worcestershire sauce

Soak meat for 24 hours in this marinade, then dry as directed.

### Using dried foods

Add dried vegetables to soups or stews. The liquid will "re-hydrate" them while cooking. They can also be used in casseroles, sauces like spaghetti, and in nearly any recipe requiring vegetables.

Fruits can be eaten as they are for snacks. They can also be "re-hydrated" by soaking or cooking in juice. The warmer the liquid, the quicker the fruit will soak it up. Use dried fruits to stew, in baking, jams, sauces, or for syrups.

Dried foods will keep a minimum of six months in storage under the proper conditions.

### Drying meat

Most USDA publications and home economists discourage drying as a means of preserving meat. While canning and freezing is the safest means of preserving meat, drying has been done successfully for centuries. This is another controversy that you will have to decide for yourself.

Jerky is the most common type of dried meat. Nearly any type of meat can be made into jerky as long as it is parasite-free. Meat which has been frozen, then thaws (as in a power outage), can be made into jerky.

Begin by trimming off any fat or connective tissue. Remove the bone. Cut into strips one-half inch thick or less. You can parboil at this time if you wish, but it is not necessary.

The next step is to soak the meat in a seasoned brine. There are many different recipes for this brine or marinade.

The easiest brine is one pound of pickling salt in one gallon water. Some folks prefer a more seasoned brine of spices, Worcestershire sauce, sugar, etc. Experiment to find your favorite. Soak the meat in the brine for 24 hours, then rinse and dry. You can also rub the seasoning in by hand, then wait a few hours and dry. Keep meat cool while it is absorbing the seasoning.

Meat is dried like fruit and vegetables. Hang the strips on racks or drape over sticks in an area with good air flow that receives full sunlight. A fire can be built nearby to give the meat a smoked taste and speed drying time if you wish.

Protect from insects with cheese cloth or other such fabric. A recycled "accordian" type clothes dryer works wonderfully for a drying rack. Since it is mobile, it can be moved close to the fire or brought inside at night so the meat can finish drying. It can also be cleaned with hot soapy water after use.

Meat is ready for storage when it is completely dry. It should be somewhat flexible but brittle enough to break when it is bent in half. Store like dried fruit or vegetables.

Jerky can be eaten as is or re-hydrated by simmering in broth or water. It can be added to soups, stews, etc. △

### Fruit compote

1 pkg (3/4 lbs.) prunes  
 1 pkg (3/4 lbs.) apricots  
 1 lg #2 can pineapple chunks,  
 drained, reserving liquid  
 3/4 c sherry wine (any red wine  
 will do)  
 1 can cherry or apple pie filling

Wash prunes and apricots in warm water. (Can use any variety of dried fruit.) Drain water. Layer fruit in bottom of 9" casserole. Spread pineapple chunks over fruit. Pour 3/4 cup of the reserved pineapple liquid over fruit. Pour wine on top. Spread pie filling. Bake uncovered at 350 degrees for 1 hour.

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# How to use those LEFTOVERS

By Marjorie Burris

**C**ongratulations! You've worked hard and have enough food stored away to feed your family, possibly for a year or more. Now, go to your store room, pick up every fourth container of food, open it, and throw the food away.

"What are you thinking?" you ask, "I wouldn't do that!" No, maybe you wouldn't throw away the food all at one time, but if you throw away leftovers a little at a time, the loss is just the same. And that old adage, "Waste not, want not," could very well be more than just a trite saying if a disaster should strike.

Although leftover is often thought of as not one, but two, four letter words, it is possible with a little thought and planning to turn a leftover into a delicious meal. In fact, a good way to save time and energy is to "cook ahead," that is, to cook enough at one time so you will have leftovers for another meal. This is especially helpful when you know you are going to have a busy day and won't have much time for cooking, or if you are tired at the end of a day and cooking is the last thing you want to do. You can even cook ahead when you know you are going to have company so that you will have less time in the kitchen and more time to visit after they arrive.

## Some basic rules

### 1. Store leftovers properly.

We all know it is necessary to cool foods quickly and keep them cool so that bacteria do not multiply rapidly. But keeping air out of the food is almost as important as keeping it cool.

Foods set in uncovered dishes in the refrigerator either take on the flavors of other foods or spoil very quickly because air molds settle onto them. Dishes covered with aluminum foil or a stretch wrap are not very air tight, either, and food stored that way in the refrigerator does not keep as well as food stored in containers with tight lids. Stretch wrap seals around the edges, but it is air permeable. Have you ever covered a dish of cantaloupe with stretch wrap or foil only to open the refrigerator a few hours later and been met with a blast of unpleasant melon-scented air? Just think what that does to the rest of the food in the refrigerator. No wonder leftovers have a bad name. The mingling of flavors in the refrigerator doesn't help leftovers a bit.

There are many good storage dishes with tight lids on the market; most of them are expensive, but they are a good investment because they do a good job and they last for years. Of course, some of my best storage dishes are the plastic tubs that butter, margarine, ice cream, and cottage cheese are sold in. These containers are made of food grade plastic, have tight lids, and last a long time. And they cost only pennies because their cost is included in the price of the food that is sold in them. Glass jars are excellent for storing foods provided the

lids fit tightly. Another plus for a glass jar—you can readily see what is in it.

Store foods in as small a container as possible to limit the amount of air getting inside. And, if you use part of the food out of a dish, transfer the remainder into a clean container using one that is just barely large enough to hold the food. Residual food on the sides of a large container dries out and spoils faster than foods packed tightly into a dish. Also, if you warm some leftovers and have part of the warmed food left over, don't put the warmed food back in the container with the other food that was not warmed. Even though you cool the whole dish quickly, the slight rise in temperature in the entire dish will give an "off" taste to the food and can hasten souring.

### 2. Use leftovers quickly.

Leftovers are more appetizing if they are used before they begin to taste stale. A good rule of thumb is to use the food within four days of being cooked. Some



### Clam Chowder

1 cup mashed potatoes  
 3 cups milk  
 6 Tbsp. flour  
 1 Tbsp. dried parsley flakes  
 1 Tbsp. butter  
 1 ten oz. can baby clams, juice and all  
 dash paprika  
 salt to taste

In a saucepan, dissolve the flour in a small amount of the milk. Stir in the rest of the milk and the mashed potatoes. Cook over medium heat, stirring occasionally, until thickened and smooth. Add seasonings, butter, and clams. Heat thoroughly. If you like a thicker chowder, use more flour.

foods will keep a little longer, and there are a few foods that don't keep well quite that long, but four days is usually a good timetable.

And, if you alternate meals of leftovers with other foods, the family isn't so likely to become burned out and balk at eating another meal of the same thing. My family doesn't mind two meals in a row of the same foods, but three meals in a row is a bit much for them to take.

#### 3. Give leftovers a new life.

Although some foods are good simply warmed up as they are, you can often turn a leftover into a completely new dish. I like the saying Celestial Seasonings has printed on one of its cups: "Bread and water can so easily be toast and tea." This saying can be applied to life situations as well as food; I take it as a challenge for either living or cooking.

Look at the dish of leftovers and start by asking, "What recipe calls for something similar to what I have here?" Rice, beans, noodles, gravies, and sauces, and cooked vegetables, especially mashed potatoes, are easy to use because they are the basic ingredients in many casseroles and soups. I've found mashed potatoes so versatile that I always cook extra mashed potatoes just to have some on hand; we like them made into pota-

### Sandwich spread

This sandwich spread recipe has been in our family for at least three generations, and it is always greeted with enthusiasm when it is served:

1 cup ground cooked meat (beef, ham, pork, chicken, or turkey)  
 2 hard boiled eggs, mashed with a fork  
 1/2 cup grated cheddar or swiss cheese  
 1 heaping Tbsp. sweet pickle relish mayonnaise, salad dressing, or tart yogurt to moisten.

Mix all well, salt to taste. Good on bread or crackers.

to pancakes, potato salad, potato soup, or as a topping for a hamburger and green bean casserole. But our favorite left-over mashed potato dish is clam chowder.

Incidentally, some canned seafood such as shrimp, clams, tuna, and salmon is a good addition to the long-term storage pantry; an occasional seafood dish can add extra nutrition as well as perk up a hum-drum meal.

Leftover beef stew is a natural for a pot pie later. Simply dice the meat and vegetables, heat with leftover brown gravy, turn into a baking dish, top with a flaky pie crust or biscuits, and bake until golden. You don't realize you are eating leftovers.

Of course, most leftover meats make good sandwiches when they are simply sliced. But you can add a little zip to cold meat by making it into a sandwich spread as well as stretching a small amount of meat to feed more people.

Gravy, either brown or white, never goes to waste at our house. Brown gravy makes an excellent sauce for a noodle casserole, especially when it is thinned with a can of cream of mushroom soup. Leftover white gravy made with sausage makes one of our favorite dishes.

When I have a small amount of meat, I like to stretch it by chopping or shredding it and simmering it in a bar-b-que

### White gravy casserole

1 cup leftover white sausage gravy  
 ½ cup milk  
 1 cup leftover cooked zucchini and carrots, drained

Mix all ingredients, turn into a baking dish. Top with crushed cracker crumbs, potato chips, or hard bread crumbs. Bake 350 degrees until bubbly, about 20 minutes.

sauce or salsa. When I use bar-b-que sauce, I serve the meat on a bun; when I use salsa, we wrap the meat with refried beans in a flour tortilla. No thoughts at all about this being leftovers.

Leftover cooked cereals such as oatmeal or wheat go easily into a bread dough or muffin recipe or they can be used as a thickening for a casserole. Bread can always be used, even if it gets hard. We like slices of "day old" bread spread with butter, sprinkled with a sugar-cinnamon mix, put on a cookie sheet, and toasted in the oven. I keep a jar of sugar-cinnamon made up all the

### Bread pudding

2 cups cubed dry bread  
 4 cups milk, scalded  
 1 Tbsp. butter  
 ¼ tsp. salt  
 ¾ cup sugar  
 4 eggs, beaten  
 1 tsp. vanilla  
 ½ cup raisins  
 nutmeg

Use the butter to grease a two-quart baking dish. Beat the eggs in the dish. Set aside. Scald the milk in a sauce pan. Soak the bread in the hot milk, add salt, sugar, vanilla, and raisins. Pour over eggs in baking dish, stir lightly. Sprinkle generously with nutmeg. Bake 350 degrees until firm, about 50 minutes. Cover tightly the last 10 minutes if it starts to get too brown on top. This will puff up, then settle back down in the dish. Good hot or cold.

# TWO GREAT DEALS!

## Dog food

1 quart leftovers - whatever  
1 envelope dry yeast  
1 ½ cups oatmeal  
1 cup dry beans-mixed is good,  
but whatever you have the most of

Put leftovers in a large pot and cover with water. Bring to a boil, add yeast, oatmeal, and beans and simmer two hours until the beans are soft. Add more water, if needed. Refrigerate or freeze. Remember, too, even a dog can get tired of leftover leftovers.

time; we like five parts sugar to one part cinnamon. French toast is better when it is made with bread that is not too soft.

Homemade croutons are easy; simply butter or oil slices of bread, then sprinkle with a mix of your favorite spices or garlic salt. Cut into cubes and toast in a pan in the oven, stirring occasionally. Better than store-bought, by far, and uses lots of leftover bread. And the old standby, bread crumbs for toppings or for breading fish or meat to fry, can be made by putting the hard bread in a plastic bag and rolling over it with a rolling pin until the crumbs are as fine as you like. Mix the crumbs with spices for added flavor. My husband's favorite bread recipe is bread pudding; I don't think he even realizes I make it in order to use my "starting to go stale" bread. He often asks me to make it for him.

Even with the best of intentions, though, there are a few times when you just can't face what is leftover in the refrigerator; that's when you make dog food, providing, of course, the food has not soured or molded. That goes in the compost as the very last resort.

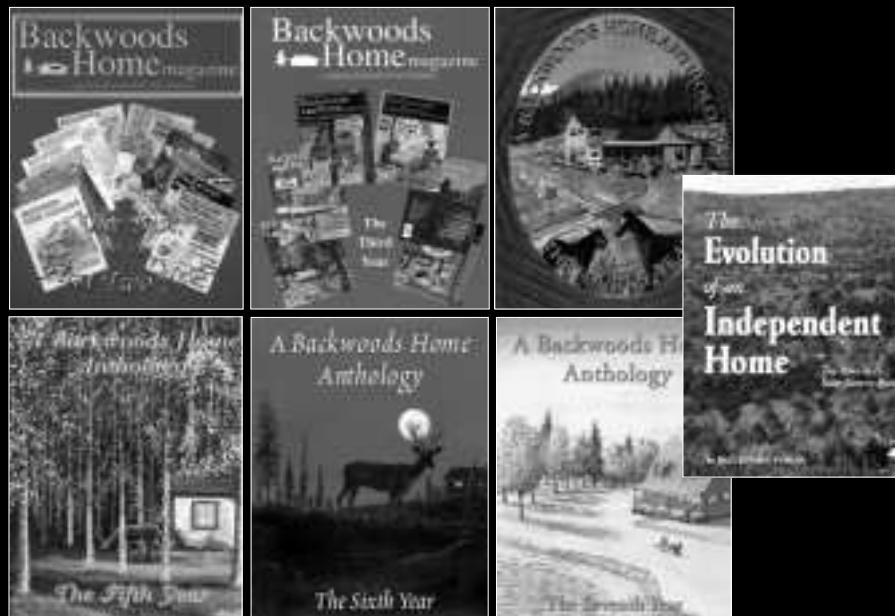
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# OKRA

*not just for the south*

*By Alice Yeager  
(Photos By James O. Yeager)*

**N**o one is quite sure about how okra seeds came to this country. Okra is of African origin and the seeds could have come in by the slave trade in the late 1600's or they might have been brought in by traders from Mediterranean ports. One thing is certain. Someone did a big favor for succeeding generations-folks like you and me who like good food that's not hard to prepare. Okra, or "gumbo", is one of those versatile vegetables that may be enjoyed in many ways-boiled, battered and fried, in soups and stews, pickled or used generously in that famous dish known as Louisiana gumbo.

This member of the Mallow Family, known officially as Hibiscus esculentus, can also serve as a tall background plant in a flower garden as its yellow blossoms are beautiful in themselves. Sad to say, like most hibiscus flowers, the blooms only last one day and they aren't listed under the heading of "cut flowers."

Okra has other uses. Roasted seeds can be ground and used as a coffee sub-

stitute and it is said that the mucilaginous nature of okra can be helpful to some folks suffering from stomach ulcers. If a flower arranger is looking for something unique for a dried arrangement, a few mature dried pods of okra from the garden may be just what is needed to give a special touch.

Behind each okra blossom develops a small green pod that grows to edible size within two or three days depending on variety. These immature pods are what we gardeners harvest for culinary use. Pods should be gathered at their tender best as the longer they remain on the plants, the more fiber build-up they will have. Pods of the older varieties of okra such as Clemson Spineless and Cow Horn can be allowed to grow to 7-9 inches before becoming tough. The newer hybrid pods seem to reach their best texture at not over 5 inches. If some pods do get beyond the tender stage, the seeds may be removed and used in soups, etc., like peas, and the fibrous part dropped in the compost pile.

Although okra is ideally suited for southern gardens, it may also be successfully grown above the Mason-Dixon line and points west if a few simple precautions are taken.

Okra is a heat lover and thrives under summer conditions. Seeds should never be planted until the ground warms up and chilly weather is no longer a threat. However seeds may be started indoors in peat pots and transferred to the garden when the time is right. This makes it possible to have okra in gardens where summer is considerably shorter than in the South. I have observed okra growing and producing well as far north as Worthington, Ohio (next door to Columbus).

Okra likes a sunny spot in well drained, moderately rich soil. Location should be prepared several weeks ahead of planting time by digging in compost, well rotted barnyard manure, chicken litter, or any organic substance that will enrich the spot. Okra requires soil with pH 6.0-8.0 which is consistent with the needs of most vegetable plants. Be careful of an excess of nitrogen in the soil as that will cause more leaf production and less pods. If you're not sure about your soil pH, it might be well to inquire about taking soil samples to your county extension agent for analysis.

In Zone 8 we have a long growing season. Our last average frost date in spring is about March 15 and the first fall date is around October 15. Therefore it is more practical for us to



**Okra's hibiscus type blooms brighten the garden. This is the Jade variety, high-yielding with tender pods and a semi-dwarf plant. Developed by the University of Arkansas.**

wait until the ground has warmed up and then plant okra seeds directly into the soil rather than transplant. Seeds are planted about  $\frac{1}{2}$ -inch deep and sown thinly. When seedlings appear and are a few inches high, we thin the plants to stand about 12-14 inches apart. In our raised bed garden we like to grow dwarf

varieties of okra as they require less space than the standard types.

In southwest Arkansas we can almost always count on a summer drought, so many of us resort to a heavy mulch of organic matter (straw, pine needles, grass clippings, etc.) to help conserve moisture. A light mulch is put down

when plants are 4-5 inches high and more mulch added as they grow. The mulch also cancels the need to cultivate as it keeps the soil loose and pliable and encourages earthworms. When the going gets rough, okra plants need a good ground soaking about twice a week. We accomplish this by using a small sprinkler set at low pressure so that water isn't wasted by being slung outside the beds. As said, okra is a heat lover and plants will start a downward trend when days begin to shorten and nights cool off toward the end of summer.

There are several ways to preserve okra for future use. One of the easiest is to freeze cut pods in water. This seems to retain the color better. Simply discard stern ends and slice clean pods crosswise in one fourth inch rounds, put them in freezer bags and fill with water allowing some room for expansion. Lay the packets flat on cookie sheets or heavy cardboard in the freezer. Remove from cookie sheets and stack when frozen. Whenever okra is needed for cooking, drop a packet in some warm water to thaw or remove the okra from the packet and place directly in the soup, etc.

Blanching okra is almost a no-no, as okra being of a mucilaginous nature does not take kindly to blanching. Some folks condemn okra without giving it a chance. "Too slimy," they say. These folks are not in the know. Simply put in a tablespoon of vinegar when cooking the okra and the "slime" disappears. One of the simplest and tastiest ways to prepare okra fresh from the garden is to boil whole pods until tender in enough water to cover. Drain and serve hot with a sprinkling of black pepper and small pats of butter or oleo.

For those who want to eat healthy, okra contains a goodly amount of Vitamin A and potassium and is low in calories. Like anything else, calories can go up with whatever is added to the okra.

There are a number of okra varieties available from seed companies. It is safe



**Fresh vegetables from the garden enhance the flavor of a pot of gumbo.**

to save seed from the standard types, but seed from hybrid plants will almost always vary from the original plants.

Annie Oakley, a hybrid, produces large spineless pods and has been a favorite of many gardeners for a number of years. Not only does it do well in the South, but it is also recommended for the North.

Hybrid Cajun Delight is a relative newcomer and a heavy producer. It has done well in our garden and is said to succeed in the North. Hybrid varieties usually start blooming a week or so ahead of the older types of okra, but weather conditions can play a big part in determining when plants begin to yield.

Lee okra is a spineless dwarf okra and one that we like to plant in our raised beds as it is a space-saver. We have always had a good yield from Lee and its flavor is superb.

Jade is a semi-dwarf plant with a high yield and was developed by the University of Arkansas. We have had good luck with Jade and have found that it continues to bear its tender pods until late in the season.

For folks who like color in the garden, Burgundy is a variety that produces deep red pods besides having the burgundy color distributed throughout the stems and leaves. This okra requires a bit more room than some of the others but gives a good yield. Too bad the pods don't retain their color when cooked, but they turn green like the other okras.

This year we're trying a new okra called Green Best Hybrid. It is advertised as having small leaves and being suitable for close planting. We'll see if Green Best can outdo Lee and Jade.

For the most part, we seldom encounter any trouble with raising okra although okra is subject to verticillium and fusarium wilts. We rotate our crops each year and that seems to be the best preventive. Stinkbugs will occasionally suck juice from a pod causing it to malform. Rather than use a pesticide, we just destroy stinkbugs when we find them.

In praising okra as being downright desirable and delicious, I feel I must be honest and also list the downside to okra. (I can hear a skeptic say,

"Lookout here it comes. It causes your hair to fall out or something.")

Let me hasten to say the drawback is in the harvesting. Beware of varieties not listed as spineless. Even so, notice that this term refers to the pods and not the whole plant. I have yet to deal with an okra plant that did not have tiny almost invisible spines on stalks and leaves. Coming in contact with the spines can lead to a burning, itching and unpleasant sensation wherever one's skin touches the plant. To be on the safe side when gathering okra, it is best to wear long sleeves and gloves or be extremely careful to avoid brushing against foliage or stems. Fortunately the unpleasantness can be relieved by washing vigorously with soap and warm water.

Having Louisiana as a neighboring state has its advantages as its wonderful cuisine, particularly from southern Louisiana, has inspired many of us to prepare vegetables in ways that we might not have thought of doing on our own. My mother, now deceased, was born in Catahoula Parish and my husband, James, was born in the town of Amelia in Assumption Parish. We

## Louisiana Gumbo

### Ingredients:

1 large dressed frying chicken, including giblets & neck  
 1½ cups of flour for dredging  
 ½ tsp. black pepper  
 1½ lb. okra cut crosswise, ¼" rounds  
 2 large tomatoes, chopped  
 2 medium bell peppers, chopped  
 1 large onion  
 1 large garlic clove, minced  
 3 Tbsp. flour, unbleached  
 3 qts. hot (not boiling) water  
 3 large bay leaves  
 1 lb. fresh shrimp, peeled and deveined  
 1 pint raw oysters and juice  
 1 Tbsp. filé  
 hot rice

**STEP 1:** Dredge chicken with flour and pepper. In iron skillet fry until brown in enough good grade cooking oil to keep from sticking. Remove from skillet and set aside in large pot equipped with lid. Reserve chicken oil to be used as needed in rest of cooking.

**STEP 2:** Combine okra, tomatoes, bell pepper, onion and garlic and fry in just enough chicken oil to prevent sticking. When almost done, put in pot with chicken.

**STEP 3:** Make what is known as a roux (a base for gravy) by combining 5 Tbsp. of reserved chicken oil with 3 Tbsp. flour in a large iron skillet. Stir constantly over medium heat until roux turns dark brown. Be careful not to burn it! (Dark brown is one thing, but burned is another.) Gradually stir water into roux a little at a time. Add pepper and bay leaves and simmer about 5 minutes stirring when necessary to prevent sticking. Pour over chicken and vegetable mixture, bring to a boil and simmer about 30 minutes.

**STEP 4:** Add shrimp and oysters to simmering mixture in pot and continue to cook about 15 minutes. Add filé after gumbo has been removed from fire and has ceased to bubble. Do not boil after filé has been added as gumbo will have a tendency to be stringy. Many cooks put a bottle of filé on the table and let guests add their own. In case you are not familiar with filé, it is made from dried sassafras leaves and is usually available in fish markets or wherever gourmet supplies are sold. A small bottle will last a long time.

**STEP 5:** Serve gumbo over hot rice in large flat type soup bowls. Prepare your rice while the gumbo is cooking and use either long-cooking unpolished rice or brown rice for good flavor. Be sure to have enough rice ready as folks are almost sure to ask for seconds.

This recipe will serve 6-8 persons depending on salad, drinks, etc., served with it.

have a number of relatives in Louisiana so we can count ourselves among the fortunate. James's Aunt Katie Graves, who is now gone, used to make gumbo as only a person from lower Louisiana can make it. (See recipe.) Of course, one of the main ingredients was okra.

If you're not acquainted with the wonderful culinary offspring of the Cajun Country known as gumbo, don't remain a stranger to it. A big steaming pot of gumbo waiting to be served over bowls of hot rice is enough to make you kick the slats right out of your cradle! Δ

## Filé

If you'd like to make your own filé it is easy to do if you have access to sassafras trees. These trees are widely distributed over the eastern half of the United States as far west as East Texas and north to southern Ontario.

Simply take a quantity of the fresh green leaves and dry them as you would any green leaf herb. When the leaves have reached a crisp stage, put them in a blender and reduce them to a powder. They are now known as filé. Store in an airtight container. Filé will keep indefinitely.

## SEED SOURCES

### COW HORN

Southern Exposure Seed Exchange  
 P.O. Box 170  
 Earlysville, VA 22936

### ANNIE OAKLEY

Pinetree Garden Seeds  
 Box 300  
 Gloucester, ME 04260

### Gurney's Seed & Nursery Co.

110 Capital St.  
 Yankton, SD 57079

### Henry Field's Seed & Nursery Co.

415 N. Burnett  
 Shenandoah, IA 51602

### HYBRID CAJUN DELIGHT

Park Seed  
 1 Parkton Ave.  
 Greenwood, SC 29647-0001

### LEE

Henry Field's Seed & Nursery

### JADE

Southern Exposure Seed Exchange

### BURGUNDY

Gurney's Seed & Nursery Co.  
 Southern Exposure Seed Exchange  
 Park Seed

### GREEN BEST

Pinetree Garden Seeds  
 Park Seed

# THE IRREVERENT JOKE PAGE

(Believing it is important for people to be able to laugh at themselves, this is a new feature in *Backwoods Home Magazine*. We invite readers to submit any jokes you'd like to share to *BHM*, P.O. Box 712, Gold Beach, OR 97444. There is no payment for jokes used.)

**A** Swiss guy, looking for directions, pulls up at a bus stop where two Englishmen are waiting. "Entschuldigung, koennen Sie Deutsch sprechen?" he says. The two Englishmen just stare at him.

"Excusez-moi, parlez vous francais?" The two continue to stare. "Parlare Italiano?" No response, "Hablan ustedes Espanol?" Still nothing. The Swiss guy drives off, extremely disgusted.

The first Englishman turns to the second and says, "Y'know, maybe we should learn a foreign language..."

"Why?" says the other, "That bloke knew four languages, and it didn't do him any good."

## Obituary-The sad passing of Pop N. Fresh

**V**eteran Pillsbury spokesman Pop. N. Fresh died yesterday of a severe yeast infection. He was 71. Fresh was buried in one of the largest funeral ceremonies in recent years. Dozens of celebrities turned out including Mrs. Butterworth, the California Raisins, Hungry Jack, Betty Crocker, and the Hostess Twinkies. The graveside was piled high with flours as longtime friend Aunt Jemima delivered the eulogy, describing Fresh as a man who "never knew how much he was kneaded."

Fresh rose quickly in business, but later in life his career was filled with many turnovers. He was not considered a very smart cookie, wasting much of his dough on half-baked schemes. Still, even as a crusty old man he was a roll model for millions. Fresh is survived by his second wife. They have two children and one in the oven. The funeral was held at 3:50 for about 20 minutes.

Two men were sitting next to each other at a bar. After a while, one guy looks at the other and says, "I can't help but think, from listening to you, that you are from Ireland."

The other guy responds proudly, "Yes, I am!"

The first guy says, "So am I! And where about Ireland might you be?"

The other guy answers, "I'm from Dublin, I am."

The first guy responds, "Sure and begora and am I! And what street you live on in Dublin?"

The other guy says, "A lovely little area it was, I lived on McCleary Street in the old central part of town."

The first guy says, "Faith & it's a small world, so did I! And to what school would you have been going?"

The other guy answers, "Well now, I went to St. Mary's of course."

The first guy gets really excited and says, "And so did I. Tell me, what year did you graduate?"

The other guy answers, "We'll now, I graduated in 1964."

The first guy exclaims, "the Good Lord must be smiling down upon us! I hardly believe our good luck winding up in the same bar tonight. Can you believe it? I graduated from St. Mary's in 1964 my own self."

About this time, another guy walks into the bar, sits down and orders a beer. The bartender walks over shaking his head and mutters, "It's going to be a long night. The Murphy twins are drunk again."

Submitted by Ted Holt

## LEARN CHINESE IN 5 MINUTES

Are you harboring a fugitive?  
See me A.S.A. P.  
Stupid Man  
Small Horse  
Did you go to the beach?  
I bumped into a coffee table.  
I think you need a facelift.  
I thought you were on a diet?  
Do you know the lyrics to the Macarena?  
You are not bright.  
I got this for free.  
I am not guilty.  
They have arrived.  
Stay out of sight.  
Your body odor is offensive.

Hu Yu Hai Ding  
Kum Hia Nao  
Dum Gai  
Tai Ni Po Ni  
Wai Yu So Tan?  
Ai Bang Mai Ni  
Chin Tu Fat  
Wai Yu Mun Ching?  
Wai Yu Sing Dum Song?  
Yu So Dum  
Ai No Pei  
Wai Hang Mi?  
Hai Dei Kum  
Lei Lo  
Yu stin ki pu.

**A** devoted wife had spent her entire life taking care of her husband. Now he was slipping in and out of a coma for several months, yet she stayed by his bedside ever single day. When he came to, he mentioned to her to come nearer.

As she sat by him, he said, "You know what? You have been with me through all the bad times. When I got fired, you were there to support me. When my business failed, you were there. When I got shot, you were by my side. When we lost the house, you gave me support. When my health started failing, you were still by my side..."

You know what?

"What dear?" She asks gently.

"I think you bring me bad luck."

Submitted by Bud Jarvis

## CLASSIFIED ADS

The following were actually taken from recent classified ads in newspapers. (You can't make this stuff up.)

1 MAN, 7 WOMAN HOT TUB--\$850/offer

2 WIRE MESH BUTCHERING GLOVES  
1-5 finger, 1-3 finger, PAIR: \$15

COWS, CALVES NEVER BRED  
ALSO 1 GAY BULL FOR SALE

FREE PUPPIES:  
PART COCKER SPANIEL  
PART SNEAKY NEIGHBOR'S DOG

NORDIC TRACK \$300  
HARDLY USED  
CALL CHUBBIE

NICE PARACHUTE:  
NEVER OPENED - USED ONCE  
SLIGHTLY STAINED

FREE KITTENS: READY TO EAT.

## YO MAMA IS SO FAT THAT...

When she was diagnosed with the flesh eating disease the doctor gave her 13 yrs to live.

She puts mayonnaise on aspirin.

Her cereal bowl came with a lifeguard.

All the restaurants in town have signs that say: "Maximum Occupancy: 240 Patrons OR Yo Mama."

When she ran away, they had to use all four sides of the milk carton.

When she gets in an elevator, it HAS to go down.

She could sell shade.

Her blood type is Ragu.

When she goes to a restaurant, she doesn't get a menu, she gets an estimate.

When she turns around, people throw her a welcome back party.

When she dances she makes the band skip.

## WHY PARENTS GET GRAY

The boss of a big company needed to call one of his employees about an urgent problem with one of the main computers. He dialed the employee's home phone number and was greeted with a child's whispered, "Hello?"

Feeling put out at the inconvenience of having to talk to a youngster the boss asked, "Is your Daddy home?"

"Yes," whispered the small voice.

"May I talk with him?" the man asked.

To his surprise the small voice whispered, "No."

Wanting to talk with an adult, the boss asked, "Is your Mommy there?"

"Yes," came the answer.

"May I talk with her?"

Again the small voice whispered, "No."

Knowing that it was not likely that a young child would be left home alone, the boss decided he would just leave a message with the person who should be there watching over the child.

"Is there anyone there besides you?" he asked the child.

"Yes," whispered the child, "A policeman." Wondering what a cop would be doing at his employee's home, the boss asked "May I speak with the policeman?"

"No, he's busy," whispered the child.

"Busy doing what?" asked the boss.

"Talking to Daddy and Mommy and the Fireman," came the whispered answer.

Growing concerned and even worried as he heard what sounded like a helicopter through the ear piece on the phone the boss asked, "What is that noise?"

"A hello-copper," answered the whispering voice.

"What is going on there?" asked the boss, now alarmed.

In an awed whispering voice the child answered, "The search team just landed the hello-copper."

Alarmed, concerned, and more than just a little frustrated, the boss asked, "Why are they there?"

Still whispering, the young voice replied along with a muffled giggle: "They're looking for me."

**A**n accountant, a lawyer and a cowboy were standing side-by-side using a urinal. The accountant finished, zipped up and started washing and literally scrubbing his hands.. clear up to his elbows...he used about 20 paper towels before he finished.

He turned to the other two men and commented, "I graduated from the University of Michigan and they taught us to be clean."

The lawyer finished, zipped up quickly and wet the tips of his fingers, grabbed one paper towel and commented, "I graduated from the University of California and they taught us to be environmentally conscious."

The cowboy zipped up and as he was walking out the door said, "I graduated from the University of Texas and they taught us not to pee on our hands."

# Ayoob on Firearms:

## Home on the range with a .357

I've written in the past that my own choice for an all around backwoods handgun that you can have with you at all times and will get the most jobs done is the .44 Magnum. However, in many areas the bear-bustin' power of the .44 Mag isn't needed, and a lot of people aren't comfortable with its brutal recoil. If that's the case, the .357 Magnum sixgun may be the best choice.

Introduced by Smith & Wesson (revolver) and Winchester (ammo) in 1935, the .357 Magnum has become hugely popular since and is now offered by virtually all revolver manufacturers and ammo companies.

Many people with rural values prefer the frontier-style single action revolver, such as the hugely popular Ruger Blackhawk. These cowboy guns harken back to frontier times and ways. For hunting or pest control, there will always be time for the necessary thumb-cocking of the hammer, and for the necessary one shell at a time loading and unloading through the single action sixgun's side gate on the right of the frame.

True all around work, however, encompasses defensive use. In the fall of 1998, Tennessee state senator Tommy Burks was murdered by gunfire at his hog farm in Cookesville, TN. A handgun readily accessible at the hip and competently wielded in self defense could have prevented that tragedy. The defensive mission makes a double action revolver with a swingout cylinder the logical choice. A single push on the ejector rod dumps out all the spent cases at once, and a nine-dollar speedloader lets you reload six at once very quickly, or load the gun at maximum speed from

a standing start if your safety protocols are such that you keep your firearm unloaded. In a close range emergency, the gun can be fired "double action" with a single long, heavy pull of the trigger being all that's necessary for each shot, or the hammer can be thumb-cocked for the light, easy trigger pull that most beginners find conducive to slow but precisely accurate shot placement, as in small game hunting.

The .357 Magnum cartridge is the same dimensions as the .38 Special but a tenth of an inch longer in the casing. This prevents powerful Magnum rounds, which fire at 33,000 to over 40,000 pounds per square inch pressure, from blowing up old .38 Special revolvers that don't have modern steels or heat treating. This means that while you can't fit a .357 Magnum cartridge into a .38 Special revolver, a .357 Magnum revolver can take both that cartridge and the .38 Special. This gives some really broad versatility options.

.38 Special snake-shot produced by CCI can take the worry out of being close in places where the serpents are poisonous. (I can tell you from personal experience that they vaporize scorpions, too.) The mildest conventional loads are the incredibly accurate .38 Special 148-grain mid-range wadcutter. This is the perfect ammo for using your .357 to teach kids or other new shooters how to hit with a handgun and handle one safely. They're also accurate enough to score head shots on squirrels at bird-feeder distance and rabbits at in-the-garden distance. This destroys no meat, allowing the creatures that once ripped off you and your birds to now contribute to the family stewpot.



Massad Ayoob

The police load for the .38 Special in the first part of the century, with an easy-kicking 158-grain round nose lead bullet, wasn't worth crap as a manstopper but it's a humane killer on small animals at close range. Because its almost pointy bullet goes through flesh like an icepick, it's ideal for dispatching animals in traps, since it does minimal damage to pelts.

For home or personal defense use by people who haven't yet grown comfortable controlling Magnum recoil, the best choice is a 158-grain all lead semi wadcutter .38 Special +P hollowpoint. Remington, Federal, Winchester, and CCI all produce such ammo. It had a great record in the service revolvers of Chicago, St. Louis, and Metro-Dade Police, and those of the FBI and the RCMP.

For defense against human beings, the best of the Magnum loads by far is the 125-grain semijacketed hollow-point .357 cartridge, produced by all the big manufacturers. It became legendary as a manstopper. Multiple studies (the ongoing work of former Detroit homicide detective Evan Marshall, and the survey done by police chief Richard Fairburn done in cooperation with the Police Marksman Association) indicate that the 125-grain .357 Magnum is more likely to

stop a gunfight with one solid hit than any other handgun cartridge in common use. Even the .44 Magnum tends to blast through erect bipeds, spending much of its greater power after exiting the body.

For deer hunting, a heavier, slower expanding bullet is better. The inexpensive "generic" American Eagle 158-grain softnose .357 from Federal cartridge wouldn't be a bad choice, and it's hell for accurate. My 8-inch barrel Colt Python will group it into 2.5 inches at 100 yards from a sandbag benchrest. Most experts feel anything bigger than a small deer is too big for a .357, though moose and bear have been killed with the cartridge. I concur, it's too small. I've killed deer and wild sheep with the .357, but went to the .44 Magnum for outdoorsmanship when I found it killed quicker and cleaner with hits in the chest than the .357 Magnum.

Still, the .357 is a good all-around camp or farm gun. I recently spent a couple of weeks on a rural firearms training complex that included a Christmas tree farm and a large family garden that small local white-tails had taken as their personal salad bar. En route to the facility, I had shot the National Police Service Revolver Championship in Jackson, MS (missed winning by ten points, dammit) and I still had with me the gun I'd used there, a Colt Python .357 with 4-inch barrel that I had carried on police patrol long ago.

The Python is an exquisitely accurate revolver, and both the .38 Special and the .357 Magnum are inherently accurate cartridges. No veggie-marauding Bambi prompted this one out of its holster during those two weeks, but it rode my belt from dawn to dusk, and it was a reassuring presence on dark nights in that remote place.

My host found it no problem to hit a man-size silhouette target six shots out of six with the Magnum loads from this Python, at a hundred yards from a two-hand prone position. A week after

I returned home, I found myself dropping by an NRA Hunter Silhouette pistol match on the same complex where I was now teaching a class. While my students watched a video, I shot the event with the 4-inch Python and Federal 125-grain Magnum hollowpoints, and was able to nail seven out of ten of the miniature ram targets—about the size of small terriers—at a hundred meters. That's probably more accuracy than we have a right to ask of a police service type revolver with a relatively short barrel.

Unless you've got really big bears in the backyard, the versatile .357 Magnum revolver will get you through the night at your backwoods home. Δ

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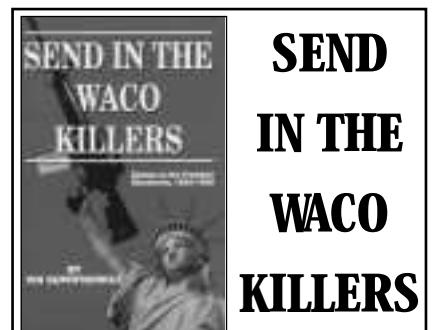
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**SEND  
IN THE  
WACO  
KILLERS**

Three times the International Society of Newspaper Editors has included Vin Suprynowicz in their list of the 12 top weekly editorial writers in North America. For years his shoot-from-the-hip style has opened the eyes of thousands to government abuse of our liberties. In this book, Send in the Waco Killers, he blends material taken from his syndicated column with new commentary to give the reader a detailed, reporter's-eye-view of how the rights and freedoms of Americans are being subverted.

He uses factual accounts from the daily news to show how the Feds use the drug war, the public schools, jury rights, property rights, the IRS, gun control, and anti-militia hysteria to increase its power and control over us. He details how agents of the ATF and FBI have routinely lied, how they use paid informants to infiltrate Constitutionally-protected militia groups, then fabricate evidence to get arrests and discredit them.

Had he lived 225 years ago he'd have written a book to detail how King George III and Parliament have tried to enslave us but, sadly, this book is about how our government today is depriving us of our freedoms and ruining the lives of thousands without changing even one word of our Constitution.

If you read no other book this year, read Send in the Waco Killers. Just keep your blood pressure medication handy. 506 pages, trade paperback, \$21.95 + \$3 S&H.

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# Cost-saving BABY TIPS

*By C.M. Hudman*

**U**ntil I had a child myself I never understood the power they had to suck money directly from the wallet.

Oh sure, I had read horror stories in nationally acclaimed magazines that stated the total cost of raising a child nears a million dollars, but this couldn't possibly be credible. How could it be? Children actually need very little outside of a loving family warmth and food. My grandmother and her mother didn't have a problem, yet women of my generation have to work 40 hours or more just to support one little tyke. Armed with a long list of necessary items I headed out on a mission—a mission to enable me to stay home with my child, if only for a few years.

The first and probably most empowering step towards cutting costs was realizing that 90 percent of the baby market was made up of acquired needs. Jars of baby food never lined my shelves, it was just as quick and easy to mash up the meat I was eating. As for formula, nothing tops breast milk. Soon I began talking

to friends, family, and grandparents and it didn't take me long to learn about the abundance of alternative products and used items.

Forcing myself to adhere to a strict budget I found some fantastic money saving solutions. Give them a try for yourself.

**Baby bath:** As a first-time mom I was very timid when it came to handling a slippery little newborn. I remember eyeing the plastic baby tubs until my mother-in-law folded a towel in the kitchen sink, then ran a couple inches of water in it. After that, I was able to bathe my daughter with confidence.



**Baby powder:** Many baby powder companies boast about the power of cornstarch. Try substituting 100% natural cornstarch for baby powder. Cornstarch works as effectively and is a whole lot cheaper. Look near the baking soda in your local supermarket. I buy mine in a box.

You will find that most powder bottles are not made to be recycled. The

lids are not removable. I recycled a large plastic spice container (4-5 oz. size). It can be easily filled and is a great size for diaper bags. As always, when recycling, clean the container thoroughly before using.



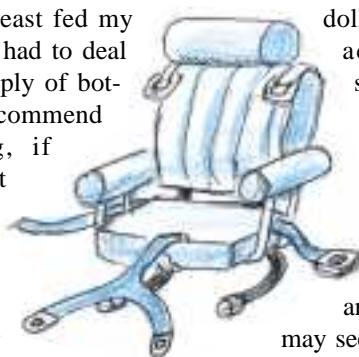
**Baby oil:** Read the ingredients on your baby oil label. The "favorite" brand name lists mineral oil and fragrance. Replace with mineral oil and forego the fragrance, saving money. Refill or switch the lid from a used baby oil bottle to get the slow pour spout.

**Blankets:** They're everywhere. I was shocked at the abundance of used baby blankets and quilts in the thrift stores and at garage sales. Buying used is the only way to go. Always wash in hot water to kill germs.

I also made a couple car blankets with sale-bought polar fleece. About a yard and a half makes a good sized, durable travel blanket. The edges can be serged or stitched with a piece of blanket ribbon on the ends.



**Bottles:** I breast fed my child so I never had to deal with a large supply of bottles. I highly recommend breast feeding, if only for a short time. Ask your doctor to give you information or to give you a contact number



for the La Leche

League. The savings is not only found in formula costs but many studies show that breast fed infants are healthier. If you should choose to bottle-feed, sterilize used bottles and replace nipples for safety purposes.

**Car Seat:** Never compromise on safety here to save money. My daughter has always had a proper car seat and used it. This however does not mean I paid full price for every one of them. Car seats are flooding the used market. Your job as a parent and consumer is to check out the safety of the car seat you find. When buying a used car seat be sure to refer to recall lists to make sure it is safe. Keep the list in your glove compartment for quick reference on the road and use it while garage sale shopping. A car seat recall list can be obtained through the local maternity ward or childbirth classes. Don't hesitate to call the companies yourself after you get a car seat home. They will be happy to inform you of recalls and obtaining replacement straps (all frayed straps should be replaced). I encourage you to have the car seat available when you call so you can read off model numbers and provide an accurate description. To find the toll free number to any company call 1-800-555-1212 to get the toll free directory.

Most car seats I came across were dirty. I bought the one my daughter uses now for only a dollar because it was so dirty. Try cleaning really dirty car seats with carpet cleaner and a scrub brush. A friend owns the same car seat, paid almost a hundred

dollars new, and my used find is actually in better shape. It shocks most when I tell the price I paid for it. After I scrubbed it up with some organic carpet cleaner it looked fantastic.

Checking recall lists and cleaning a used car seat may seem like an awful lot but it really adds up to a matter of minutes. Once you find out you are pregnant keep an eye out for a car seat. Ask around. The savings can be remarkable.

**Clothing:** I got sucked into this money drain along with other new moms. Please, take some advice from someone who has been there. Limit your baby's closet to necessary items only and you will save hundreds of dollars. I understand the lust to buy some adorable outfits, but when you start wasting money the true needs of your child suffer. Wouldn't that 20 bucks be better invested in a college fund or a savings bond?

Search the thrift stores, garage sales, and consignment shops. Once you discover the great clothes for dirt-cheap prices you'll never go back to retail ripoffs. My daughter was dressed in brand name clothing for literally pennies on the dollar. She looked great. Used clothing is recycling at its best. No wasted packaging or store bags. Pass the tradition on to others by donating clean clothing, especially warm winter clothing, to orphanages

or women's shelters. There is an incredible need for these items. Take your children along to show them how truly blessed your family is.



**Crib:** Babies spend a lot of unsupervised time in the crib, so safety is important. Your local child birth classes or maternity ward will be able to tell you the safety checks you should perform on every crib, new or used. Don't assume you have to buy new. Just be alert to dangers and never compromise on safety.

**Diapers:** Replace pricey disposable diapers with cloth diapers. Even with added washing and drying, the savings adds up to a hefty amount. The initial cost of cloth diapers can be avoided if you encourage family and friends with the words that you would prefer cloth diapers to frilly gifts.

Try sewing up your own cloth diapers out of absorbent flannel, with Velcro closures and fun patterns, and you may find yourself the envy of your local mother's club.

**Diaper Bag:** My answer to the diaper bag dilemma was a backpack. It was perfect for trips and fit conveniently on my back when I shopped. With a baby on one hip, the last thing needed is a diaper bag sliding down the other shoulder. I still use the L. L. Bean backpack I found for two dollars at a garage sale and my child is over four-years-old now and looks none the worse for wear.

There are many options and designs available in today's backpacks. You may choose a simplistic design or one with added compartments. Whatever you pick, spend a little more money and buy from a company that offers a lifetime warranty. A backpack is never outgrown and is continually useable, so be smart and pass up on the cheap plastic baby bags.



**Diaper Rash Solutions:** If diaper rash should occur simply let your baby's bottom dry out. Clean, rinse,

and dry your little one then let your baby run wild, diaper free. To "nip it in the butt," as you might say, use a hair dryer (warm setting) sweeping back and forth to dry out moisture from your baby's bottom. I never had problem with diaper rash because I took this action at the first sign of a rash. It cured up every rash wonderfully.

**Diaper Rash Ointment:** A simple homemade diaper rash cream that works better than store-bought is an equal mixture of corn starch and petroleum jelly. It creates a smooth silky cream. Try it and you will never go back to overpriced chemical brands. It is also easier to wipe clean than store brands. I mixed this ointment up for many friends who love it and can't believe how little it costs compared to anything brand named.

**High chair:** I bought a used high chair for seven dollars and sold it two years later for twenty-one at a consignment shop. This shows that taking good care of your items will pay off in the future. Go ahead use it for free.

**Immunizations:** When enrolling my daughter into preschool, her teacher let me in on a great saving tip. The county public health department gives immunization shots for a couple dollars verses the outrageous amount the hospitals charge. Call your county's public health agency to get the details.

**Shoes:** \$30 baby sneakers are an acquired need. There is no reason for a three-month-old to wear shoes. Hold off on buying shoes until your toddler is walking.

**Soap:** Use a mild soap for baby's skin instead of baby wash. It lasts longer, there is less packaging, and works just as well. Switch the whole family over to a bargain-brand baby shampoo or use a very small amount of regular shampoo on your baby.

**Stroller:** Stained, used strollers can be salvaged by simply scrubbing with a strong stain removal solution and a good cleaning. A good potent paste made up of dishwasher deter-

gent, color safe bleach, and water is one of the most effective cleaners on protein type stains that plague the used children's products market. Simply soak, then rinse clean in the shower or power wash with the hose in the front yard.

**Swing:** The best baby gift I received was a hand-me-down swing from a friend. I kept it in great condition and handed it down myself. Don't hesitate to give and accept valuable used items because you think a new item will "show" better at the shower. It's often the practical gifts given by veteran moms that save the day.

**Wipes:** Buy a bunch of cheap washcloths to use for this specific purpose. Before messy changes, wet down a couple for quick, easy cleanup. Throw in the bucket with your cloth diapers and wash in the same load. For a baby on the go keep wet washcloths in a plastic baggies. They work so well I still carry a couple for my three-year-old.

HOMEMADE WIPES CAN BE MADE BY CUTTING A ROLL OF THICK PAPER TOWELS (BOUNTY WORKS WELL) IN HALF. REMOVE THE CARDBOARD ROLL AND PLACE IN A RECYCLED AIRTIGHT ROUND CONTAINER. ADD A TABLESPOON OF BABY MAGIC BABY SOAP, TWO TABLESPOONS OF BABY OIL, AND TWO CUPS OF WATER. SHAKE AND ALLOW THE MIXTURE TO SOAK UP INTO THE TOWELS, INVERT THE CONTAINER IF NECESSARY. PULL THE TOWELS FROM THE CENTER. △

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# Think of it this way...

## We don't need no steenkng 2nd Amendment

By John Silveira

I usually get up to the magazine from southern California in plenty of time for the bimonthly deadline. Not this issue. I was late and way behind. But getting up here late doesn't lessen my workload; it just stretches out the number of hours I have to work each day. There's less time to relax, visit, or spend with friends. That said, three of us, Dave Duffy, O.E. MacDougal, and I went shooting anyway and depreciated a huge amount of ammunition on a hillside up behind Duffy's house. Duffy, of course, is the fellow who publishes this magazine. Mac is Dave's poker-playing friend from the old days.

After a hard day of knocking down cans and collecting brass, we got back to the office and discovered that Dave's old college buddy, Bill, had stopped by. Dave and Bill began talking about old times, but the phone rang and took Dave out of the conversation.

I, in the meantime, had disassembled my rifle and there were pieces in my lap and some on my desk. Mac was off in the corner reading a copy of the last issue of BHM.

"What are you doing with that?" Bill asked.

I looked up. He was talking to me. I looked down in my lap at the gun parts I had there. "I'm cleaning it," I said.

"What do you need it for?" he asked.

"I don't usually clean them but..."

"No, not why do you need to clean it, why do you need a gun?"

"Why do I need it?"

"Yes."

"I want it," I said.

"But why do you need one?" he persisted.

"Need one?" I asked again, not understanding his question. "I don't follow you."

"How many guns do you have?"

"You mean 'own' or how many did I bring up with me?"

My question seemed to put him off.

"How many do you own?" he asked in a voice that was tinged with exasperation. "How many guns do you have here, there, and everywhere?"

I thought a minute. "About a dozen."

He screwed up his face. "What do you need 12 guns for? If you need a gun, one should be enough."

"Enough for what?"

"What do you need a gun for?"

### The meaning of the 2nd Amendment

He was back to that. "I don't know where this is going. I don't even understand your question," I said. "I don't have to need a gun to own one any more than I need a CD player or a couch to own one of those. The 2nd Amendment says I can have them. It doesn't say I have to show a need and it doesn't limit the number I can own."

Bill shook his head. "So, you're one of those."



**John Silveira**

Dave finished his call and turned to us as he hung up and said, "Bill, what do you mean by needing a gun?"

"The 2nd Amendment isn't about you guys owning guns," Bill said. "It's about the state having guns. It says you're only allowed guns if you're part of the militia and I don't see any of you guys with uniforms. The 2nd Amendment is about the National Guard."

"I don't think that's what it means," Dave said.

"It says it right in the amendment. It's for the militia. You can even ask Mac," he said and pumped his thumb back to the corner where Mac was quietly reading. "I'll bet even he agrees with me."

I think Bill was baiting Mac. He and Mac had had a lively discussion about our rights the last time Bill was here about two years ago (Issue No. 44 March/April 1997). But Mac didn't look up. He just kept reading.

Dave got out of his seat and pulled down the almanac from the bookcase and flipped through the pages. Then he began to read, "A well regulated Militia, being necessary to the security of a free State, the right of the people to keep and bear Arms, shall not be infringed."

"See," Bill said. "It's about having a well regulated militia. Militia—that's military. It's not about you."

"Well, a whole bunch of people think it's about individual gun ownership," Dave said.

"But it's not. Read the amendment again. It's about the militia. It's only you gun nuts who think it's about you."

I shrugged. The wording of the 2nd Amendment has always bothered me.

But Dave looked off into the corner to where Mac was still reading. "What do you think?" he asked.

Mac just looked at us and smiled, then went back to his magazine.

"See," Bill said. "Even he knows it's about the National Guard, not you guys."

"The National Guard didn't exist when the 2nd Amendment was written. It came into existence over a century later," Mac said without looking up and he continued to read.

"What?" Dave asked.

"I said the 2nd Amendment isn't about the National Guard. The Bill of Rights was adopted in 1791. The act that created the National Guard wasn't enacted until 1903."

"Well, you know what I mean," Bill said. "It's to allow the states to have state police and things like that."

Mac continued to read.

"Is that true?" I asked.

Mac looked up when he realized I was talking to him.

"You mean was it for the state police and such?" he asked me.

"Yes," I replied.

"No."

Bill smiled. "Mac, it says right there in black and white—Dave just read it to us—that it's to ensure we have a well regulated militia."

I looked expectantly to Mac who seemed to be getting impatient because he really was trying to read. "Could you give us a little input into this?" I asked him.

"I can tell you that when the Founding Fathers used the word militia, it meant something different to them than what it means to us now," and he continued reading.

"Is that all you've got to say?" I asked.

He looked at me, then back at his magazine. He knew we weren't going to let him stay out of this and he reluctantly closed it.

### What is the militia?

Now that I had him I asked, "What's this about how the guys who founded this country used the word militia?"

"You've got to understand what the militia is," he said. "In May of 1792, five months after the adoption of the 2nd Amendment, the Militia Act was passed. That act distinguished between the enrolled militia and the organized militia. Before the passing of that act, there was only the enrolled militia, which was the body of all able-bodied men between the ages of 17 and 44, inclusively, and it is that militia to which the 2nd Amendment refers. It couldn't refer to the organized militia because it didn't exist yet. The 2nd Amendment was to ensure that this body of citizens is armed and that's why the Founding Fathers thought to place it in the Bill of Rights. Legally, both militias still exist."

"Are you saying I'm in some militia?" Bill asked derisively.

"By law, you were. I would guess that, by now, you're over that age."

"So, you're also saying only people between 17 and 44 are allowed guns, right?"

"No," Mac replied. "That's just the ages of the body of men constituting the militia. The amendment says the people can both keep and bear arms. It's usually been construed to mean all the people."

"I don't believe you."

Mac shrugged, reopened his magazine and resumed reading.

"What don't you believe?" I asked.

"Anything. First, I don't believe that I'm part of any militia or ever was. Second, I don't believe that the 2nd Amendment refers to the people at

large and not the army or some other state or federal organization."

"I still don't get this thing about the organized and the enrolled militia?" Dave said.

Mac put the magazine down again. He shook his head and muttered something about fishing in Alaska from now on. He got up

out of his chair and walked out the door. Through the window we could see him in the parking lot fishing around in the trunk of his car until he finally pulled something out. It was a tattered black briefcase. He carried it back into the office and put it on the desk next to his magazine. He opened the briefcase and took out a sheaf of papers and fanned through them.

"I was looking up some stuff on the 2nd Amendment for a lawyer friend I play poker with down south," he said, meaning southern California, "and I still have some of the papers."

He stopped fanning them.

"Here are copies of the Militia Act," he said and held them out to Bill. "They explain what the militia meant to the Founding Fathers. They also show that the 2nd Amendment came before Federal law created the organized militia and provide evidence that what they referred to as the enrolled militia—the body of citizens—were allowed to arm themselves."

Bill waved them away. "All that happened 200 years ago," Bill said. "Militia means something else today. It means the military."

"No, the law hasn't changed," Mac said. "But even if we decide the word means something new to us, you can't use the new definition to change the intent of the Amendment."

"That's your opinion and you're entitled to it. But times have changed



and we need new interpretations of the words and of the Constitution."

"It's not just my opinion," Mac said. "The Supreme Court has ruled that the words in the Constitution mean what the Founding Fathers said they meant, and we can't go changing or amending the Constitution by giving new meanings or new shades of meaning to the words. And, if you think about it, it makes sense; otherwise, our rights really mean nothing. Congress or any other governing body can deny you the right to free speech, freedom of religion, a trial by jury, or whatever else it wanted just by claiming the words now have a new meaning. An oppressive government could change the Constitution without ever having to go through the bothersome ritual of submitting it to us, the people, for our approval. And, in the end, the Constitution and, in particular, the Bill of Rights are there for our protection, not for the benefit of the government or those who run it."

"Well, I don't buy into these definitions you have of militia and such," Bill said. "I don't believe the 2nd Amendment gives John or anyone else the right to privately own guns. I think your interpretation is just a well-presented opinion and that the 2nd Amendment really refers to the powers given to the states."

## Why we don't need the 2nd Amendment

Mac shrugged. "That's okay. Even if you're right and the 2nd Amendment refers only to the National Guard, the state police, or some other uniformed military or police organization we'd still have the right to keep and bear arms. We don't need the 2nd Amendment."

"What?" Bill yipped. "If the 2nd Amendment is about the states, and not the individual, you don't have the right to own guns."

"Yes we do," Mac said.

"Wait a minute," Dave said, "How do you figure we'd still have the right to have guns? Without the 2nd Amendment we're lost."

Bill was laughing, "Yeah, how do you come up with that?"

"Because the Founding Fathers believed we had that right. They spoke about it and wrote about it. And that's enough."

Bill laughed harder. "That'll look good in court: 'I can carry a gun because some guy who's been dead for 200 years said I can. Here, let me show you the note he gave me. It's in the form of a permission slip. Can I get a hall pass, too?'"

Dave laughed at what Bill said, but Mac didn't seem in the least perturbed.

"I think Dave and Bill are right," I said. "The whole question of gun rights hinges on what the 2nd Amendment means. If it means the right to bear arms belongs to the states, then it means you and I don't have any right to individual gun ownership."

"Well, let's start with this," Mac said. "Can you find anything in the 2nd Amendment, or any other part of the Constitution, that says the individual can't have arms?"

"What's that got to do with it?" Bill asked.

"That's not an answer. Just keep in mind my question is not whether you think the Constitution allows individuals to carry guns but whether or not there's anything in it that says they can't?

"Anyone can answer it, but the question is really directed at Bill."

There was a long pause while we all thought about that. I don't know where Mac was taking this, but it smelled suspiciously like a trap and I'm sure Bill felt that way, too.

Mac waited patiently.

"I don't think so," Dave finally said. I agreed, too, but Bill still didn't say anything.

## Natural Rights

"And do you also understand that the Bill of Rights is not the source of our rights. It's not even a complete list of our rights."

"What are you talking about?" I asked.

"Mac's losing it," Bill said and threw his arms up.

"I'm asking you if you understand that we do not get our rights from the Bill of Rights."

"Of course we do," Bill said. "That's why they wrote the Bill of Rights."

"I've got to agree with Bill," I said.

Dave said nothing. He seemed to be thinking.

"I'm saying this because the Founding Fathers did not believe we got our rights from the Bill of Rights. Nor did they believe they came about as a result of being American, Christian, of European decent, or white. They believed everyone had these rights even if they lived in Europe, China, or the moon. They called them Natural Rights. Where these rights were not allowed, they believed they still existed but were denied."

"You should be writing fiction," Bill said.

"Well, it's a question as to whether or not our rights exist apart from government," Mac said. "Let me ask you this," he said to Bill. "In a country where children have no civil rights, do they still have a right not to be molested? Do women in countries where they have a second-citizen status have the right not to be abused by their husbands, even if the government won't protect them?"

Bill didn't answer.

"Then is it too much of a stretch for you to understand that the Founding Fathers believed everyone has the right to free speech, freedom of religion, the right to fair trials...?" His voice trailed off.

Bill still wouldn't answer.

## A Backwoods Home Anthology

"In other words," Dave said, "it's a question as to whether the rights of the citizens in China are at the pleasure of the government or if they have them but are being denied, or if the Jews had basic human rights in Germany even if Hitler didn't let them exercise them?"

"Yes. All I want to know is if that's hard for you to see." He looked at Bill who was still silent.

"Then I see what you're saying," Dave said, "But I'm not sure how it relates to the 2nd Amendment."

Bill still said nothing—but neither did I.

"Take it a step further. If the government passed a law tomorrow that said we didn't have the right to free speech, or the right to free worship, or freedom of the press, would those rights no longer exist, or would they be simply denied? If the Constitution is amended depriving us of our rights, do those rights cease to exist?"

"What's the answer?" Dave asked Mac.

"The answer, according to the guys who set up this country, is yes, we would still have those rights. We're just being denied them. Because of that, it's the way we have to look at the Constitution."

Bill rubbed his nose.

Dave said, "Okay, I never thought of it that way, but I'll buy into it for a moment."

"It may be," Mac said, "that in reality, rights are a figment of our imagination. But the Founding Fathers believed they existed and that's how this country was set up. Rights are something that come with being human. The Founders never believed we got them from the government. If and when the United States goes away, the rights will still be there."

### Why a Bill of Rights?

"Then why have a Bill of Rights?" Bill asked. The question was posed as a challenge.

"You're not the first person to ask that. Men like Alexander Hamilton asked it. He and many others thought having a Bill of rights was dangerous."

"Dangerous," Bill laughed. "How could it be dangerous?"

"They were afraid that the existence of a Bill of Rights as a part of our Constitution implied that the government not only had the right to change them, but that any rights not listed there were fair game for the government to deny. And, as a matter of fact, that's exactly what has happened. The government seems to have set itself up to be an interpreter of our rights; it acts as if it is also the source of our rights, and whatever rights weren't mentioned in the Bill of Rights, the government has seen fit to declare exist only at its discretion."

"Then how do we know what our rights are in court?" Bill asked.

"Have you ever read the Bill of Rights?" Mac asked. I think he was tired; there was no humor in his voice. "Specifically, have you ever read the 9th and 10th Amendments?"

Bill smiled and shook his head. "I never thought it was important to memorize them."

"It's important to understand what they say and know why they are written the way they are because they tie in with how the Founding Fathers viewed our rights and how they expected us to view them.

"They were put there to quell the fears of men like Hamilton who were afraid that any rights not mentioned in the Bill of Rights would be usurped by the government. The 9th says:

**The enumeration in the Constitution, of certain rights, shall not be construed to deny or disparage others retained by the people.**

"This means that any rights not mentioned in the Bill of Rights are not to be denied to the people.

"The 10th says:

**The powers not delegated to the United States by the Constitution, nor**

**prohibited by it to the States, are reserved to the States respectively, or to the people.**

"So any powers not specifically given to the Federal government are not powers it can usurp."

"So it's enough to show the Founding Fathers thought we had a right for it to fall under the protection of the 9th or 10th Amendment. This means that the Founders didn't even have to specify we have the right to free speech, religion, jury trials, or anything else. To understand what they felt our rights were, all you had to do was show what they said our rights are. Any rights in the first eight Amendments are just redundant with what the Founding Fathers considered Natural Rights."

Bill rolled his eyes.

"Then why do we have a Bill of Rights?" I asked.

"Because even though Hamilton and others feared having one, most of the Founding Fathers were sure that without one the government would eventually take all of our rights."

"Just getting off the gun issue for the moment," Dave quickly asked, "are there actually rights not mentioned in the Constitution that you'd say we've been denied?"

"Sure. The Founding Fathers felt we had a right to unrestricted travel. So, now we have driver's licenses, automobile registrations, and passports. They also felt we had property rights, so Civil Forfeiture or Civil Seizure laws, now exercised by the Feds and the states, are actually illegal under both the 9th and 10th Amendment."

"And," he continued, "if the Congress or even the Supreme Court decides the 2nd Amendment only refers to formal military organizations, we still have the right to keep and bear arms, because the Founding Fathers considered it a natural right. And if you don't believe it, read what the Founding Fathers said in their papers, their letters, and their debates in both Congress and the state legislatures."

He pulled more papers from his briefcase and started going through them.

"You know," he said, "weapons have always been important. In Greece, Rome, and even under Anglo-Saxon law, when slaves were freed, part of the ceremony included placing a weapon in the man's hand. It was symbolic of the man's new rank."

## What the Founders said

He paused as he looked through the papers. "Here's one, and I quote:

**Arms in the hands of individual citizens may be used at individual discretion...in private self-defense.**

"That was said by **John Adams** in A Defense Of The Constitution.

"Here's another one:

**The Constitution shall never be construed to prevent the people of the United States who are peaceable citizens from keeping their own arms.**

"That was said by **Samuel Adams**, John Adams' second or third cousin, during Massachusetts' U.S. Constitution ratification convention in 1788."

"This is all bull," Bill said.

Mac looked up, then he started to put the papers back in the briefcase.

"No, I want to hear more of this," Dave said. "What else have you got there?" Dave asked, and Mac began going through the papers again.

"If you really want to hear what they had to say, here are a few by Jefferson:

**The strongest reason for the people to retain the right to keep and bear arms is, as a last resort, to protect themselves against tyranny in Government.**

"And here's another by him:

**No free man shall ever be debarred the use of arms.**

"He wrote this as part of the proposed Virginia Constitution, in 1776.

## Personal protection

"And here's one more. It's Jefferson quoting **Cesare Beccaria**—a Milanese criminologist whom he admired who was also his contemporary—in On Crimes and Punishment:

**Laws that forbid the carrying of arms...disarm only those who are neither inclined nor determined to commit crimes...Such laws make things worse for the assaulted and better for the assailants; they serve rather to encourage than to prevent homicides, for an unarmed man may be attacked with greater confidence than an armed man.**

"I think it's pretty clear that Jefferson felt we had the right to keep and bear arms for both personal protection and as a safeguard against tyranny."

Bill went and poured himself some coffee and acted, for all the world, as if he wasn't listening anymore.

Mac shuffled through a few more papers. "Here's one by **Thomas Paine** that comes from his Thoughts On Defensive War written in 1775:

**Arms discourage and keep the invader and plunderer in awe, and preserve order in the world as well as property. Horrid mischief would ensue were the law-abiding deprived of the use of them.**

"And here's one from Georgy Boy:

**Firearms stand next in importance to the Constitution itself. They are the American people's liberty teeth and keystone under independence. From the hour the Pilgrims landed, to the present day, events, occurrences, and tendencies prove that to ensure peace, security and happiness, the rifle and pistol are equally indispensable. The very atmosphere of firearms everywhere restrains evil interference—they deserve a place of honor with all that's good.**

"Who's Georgy Boy?" I asked.

"**George Washington**. That was from a speech he made to Congress

on..." He looked at the paper again. "...January 7, 1790.

"But that's not the only quote from him. In response to a proposal for gun registration he said:

**Absolutely not. If the people are armed and the federalists do not know where the arms are, there can never be an oppressive government.**

"I think that's pretty clear." He lowered the pages and looked at Dave. "More?"

"Do you have more?"

He went through more of his papers. "Here's one of my favorites:

**To disarm the people; that it was the best and most effectual way to enslave them.**

"That was by **George Mason** when the Constitution was being debated."

"And who, may I ask, was George Mason?" Bill asked. "It sounds like you're bringing in the second string now."

"He's the most underrated and unsung of all the Founding Fathers. Jefferson drew on him when composing the Declaration of Independence; his doctrine of inalienable rights was not only the basis for the Virginia Bill of Rights in 1776, but other states used them as the models for their own Bill of Rights, and James Madison drew upon them freely while composing the Bill of Rights for the United States.

"Even though a Southerner, Mason recognized the evils of slavery and the fact that slaves were entitled to the same rights as the rest of humanity. He also feared the Constitution because it didn't do a better job of limiting the powers of the Federal government. He believed local government should be strong and the Federal government kept weak. He firmly believed in the power, the rights, and the integrity of the individual."

"Never heard of him," Bill said.

"I'm not surprised. But you're not alone because most people haven't."

"Why's that?" Dave asked.

"He suffered bad health and had all kinds of family problems, so he never attained any office outside of Virginia—other than his membership to the Constitutional Convention in Philadelphia. But he was the most vocal of the Founders on individual rights, and the other Founding Fathers recognized him as a force to be reckoned with. Without him, I can guarantee you that the United States would not be as free as it is now.

"You guys should do an article on him," he said to Dave.

Dave quickly wrote something on his notepad, then glanced at me.

## Defense against tyranny

Mac continued to go through his papers. "Here's a quote by **Elbridge Gerry**, a representative to Congress from Massachusetts during the debates over the Bill of Rights. He's also the man for whom gerrymandering is named because, as governor of Massachusetts, he tried to rig districts to favor his party. In this quote he was specifically referring to what we now call the 2nd Amendment:

**What, Sir, is the use of a militia? It is to prevent the establishment of a standing army, the bane of liberty... Whenever Governments mean to invade the rights and liberties of the people, they always attempt to destroy the militia, in order to raise an army upon their ruins.**

"That should also give you insight as to how the Founders defined the militia and why they thought it was important."

"Okay, I've heard enough," Bill said.

"Me too," Dave added.

"There's one more," Mac said. "It's kind of a long one, but it's by **James Madison**, the guy who wrote the Constitution and actually put together the Bill of Rights."

"Okay, go ahead," Dave said.

**The highest number to which a standing army can be carried in any country does not exceed one hundredth part of the souls, or one twenty-fifth part of the number able to bear arms. This portion would not yield, in the United States, an army of more than twenty-five or thirty thousand men. To these would be opposed a militia amounting to near half a million citizens with arms in their hands, officered by men chosen from among themselves, fighting for their common liberties and united and conducted by governments possessing their affections and confidence. It may well be doubted whether a militia thus circumstanced could ever be conquered by such a proportion of regular troops. Besides the advantage of being armed, it forms a barrier against the enterprises of ambition, more insurmountable than any which a simple government of any form can admit of. The governments of Europe are afraid to trust the people with arms. If they did, the people would surely shake off the yoke of tyranny, as America did. Let us not insult the free and gallant citizens of America with the suspicion that they would be less able to defend the rights of which they would be in actual possession than the debased subjects of arbitrary power would be to rescue theirs from the hands of their oppressors.**

"I kind of like that one," Dave said.  
"So do I," Mac said.

"I've got more, but I think that's enough. But I think you can see how the Founding Fathers felt about the right of individuals to have weapons. In fact, this whole debate over the right to arms is a recent one. In the last century, Americans would have been as amazed to find their right to have weapons a subject of debate as they would to have found their right to free speech or religion debated. There

was no question to them, or to the Founders, that the right to keep and bear arms was one of the most fundamental—perhaps the most fundamental—of all civil rights."

"Are any of the Founders on record saying they don't believe individuals should have guns?" Dave asked.

"None I know of—and I've actually looked for some."

"Do you know of any, Bill?" he asked.

Bill didn't reply. Again, I thought he was acting as if he wasn't listening.

The phone rang again and someone called across the office to tell Dave it was an advertiser, so he took the call.

Mac put his papers back into the briefcase and picked up his magazine and started to look for his place.

Bill had even lost interest in the conversation. And it was time for me to get back to work. As I said, I was way behind. I took a last look at the gun parts to ensure they were clean, and I began to reassemble the rifle.

But I turned back to Mac for a moment and asked, "The lawyer friend you found this information for...were you giving him legal advice, doing research for him, or what?"

"I was winning a bet," he said.

"What were the stakes?"

"A six-pack of beer."

"That seems like a paltry sum to have gone through all this research for."

"We're going to drink it in Florida," he said.

"Oh," I replied and continued to reassemble the gun. Δ

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